Universitat de València
Facultat d' Economia
Departamento de Dirección de Empresas "Juan José Renau Piqueras"

TESIS DOCTORAL

SUCCESS FACTORS IN FUNDING ACQUISITION FOR RESEARCH PROJECTS THROUGH COMPETITIVE CALLS: A STUDY OF R&D PUBLIC CENTRES

PRESENTADA POR:
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Doctorado Internacional
Programa de Doctorado en Dirección de Empresas (3017)

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"El talento es algo bastante corriente.
No escasea la inteligencia, sino la constancia"

Doris Lessing

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Abstract

RESEARCH PURPOSE

In recent years, the capacity of public research and development (R&D) organizations to raise competitive funds has been key to guaranteeing their survival and the future of the current public welfare systems implemented in most European countries (Bazeley, 1998; Lee and Om, 1996; Muñoz, 2007; Santamaría, Brage-Gil and Modrego, 2010). Although the current literature describes the features and impact of international funding programmes (Galsworthy and McKee, 2013; Grimpe, 2012; Laudel, 2005, 2006), the magnitude of work groups efficacy in R&D organizations performance (Choi, Price and Vinokur, 2003; Lin, Yang, Arya, Huang and Li, 2005), and the influence of support from managerial structures on R&D work teams (Kennedy, Loughry, Klammer and Beyerlein, 2009), the factors that may influence the capacity of national research and development groups to apply for and obtain competitive funding does not seem to have been studied in depth.

The objective of this study was to identify and analyse which factors can have a significant influence on the success of research groups in international competitive fund application and acquisition within public R&D entities, paying special attention to the role of project management offices and R&D groups. The research established work teams as unit of analysis, with coordinators or Heads of Areas that manage their research performance. Research Management Offices, as organizational structures for supporting research teams, have also been considered, and how these departments promote and influence the success of applications for internationally funded projects has been analysed.

The research is supported by the Attention-Based View of the Firm Theory (Barnett, 2008; Barreto and Patient, 2013; Cho and Hambrick, 2006; Kahneman, 1973; Kaplan, 2008; Ocasio, 1997, 2011), the Self-Determination

Theory (Deci and Ryan, 1985a; Eby, Freeman, Rush and Lance, 1999; Gagné and Deci, 2005; Ryan and Deci, 2000; Thomas and Velthouse, 1990), and the Contingency Approach (Drazin and Van de Ven, 1985; Lawrence and Lorsch, 1967; Thompson, 1967; Zeithaml, Varadarajan and Zeithaml, 1988). Based on these theoretical frameworks, we have addressed the aforementioned gap in the research by introducing a model which tests three sets of hypotheses about key relations between the main actors in the determination of researchers' final performance within public research organizations with respect to the application (proactivity of R&D Groups) and acquisition (efficacy of research centres) of international competitive funding, as well as the relation between these two variables. The model analyses the effect of the priorities of public R&D centre Heads of Areas and the incentives and workload of Project Management Offices on the proactivity of R&D groups and the efficacy of their public institutions, controlled by the effects of the number of researches or the size of these institutions.

METHODOLOGY AND DATA ANALYSIS

The model focuses on R&D activities carried out in Spanish public centres in the areas of Health and Biomedicine, since these research fields perfectly illustrate the current patterns of modern Science and Technology R&D systems. Moreover, we conducted our analysis among Spanish public R&D non-profit making entities, since records reveal that Spain is relatively unsuccessful in terms of R&D results and intellectual property performance in comparison with other European Member States (Informe COTEC, 2014), with one of the priorities of the Spanish National Strategy being the reinforcement of internationalization parameters.

For the empirical analysis, we tested this model with both secondary data and primary field survey data from 68 research centres, through different types of questionnaires addressed to the CEO or Director, Heads or persons responsible for the different R&D Areas, and Heads or persons responsible for the Project Management Office or International Projects Management Department of the R&D Centres included in the study.

The research model was tested using the partial least square (PLS) technique, a variance-based structural equation modelling (SEM) method. We used PLS given our focus on the prediction of behavioural outcome constructs as well as a small sample size (Ching and Newsted, 1999).

MAIN RESULTS

Results revealed that priorities for the Heads of the R&D Areas and the workload of the Research Management Offices are significantly associated with the proactivity of R&D groups and efficacy of the centre in question. In addition, our analysis showed that the incentives policies of Research Management Offices are significantly associated with the proactivity of R&D teams, regardless of the size of the centre or the number of researches it employs, which was taken as a control variable.

Overall, our study presents new empirical evidence for the different interested parties (research institutions, R&D groups, research management offices, etc.) that affords insight into the variables that determine success in obtaining international competitive funds. This insight may be of use in helping to carry out an internal analysis, implementing the appropriate measures to improve outcomes in obtaining and securing greater competitive funds. In fact, by analysing the relative relevance of these factors in terms of their influence on success in obtaining funds within public institutions (their proactivity and resulting efficacy), we can help R&D centres to improve their research strategy in general and the performance of research groups in particular, so that they will assign their resources more effectively and become more successful in obtaining external funds. Further, the results obtained in this study may help to clarify the Spanish paradox –national performance below international expectations in terms of R&D, innovation and intellectual/industrial property outcomes–, and could also be applied to other European countries showing similar patterns. Additionally, national research systems may benefit from this knowledge by increasing their possibilities of obtaining resources among competitive funds and improving the overall sustainability of their science and technology systems.

Resumen

TEMA DE INVESTIGACIÓN

Durante los últimos años, la capacidad de generación de recursos financieros derivados de la obtención de fondos competitivos, ha sido una preocupación creciente para las organizaciones públicas de investigación y desarrollo (I+D), al garantizar su supervivencia y el futuro de los actuales sistemas de bienestar público implementados en la mayoría de los países europeos (Bazeley, 1998; Lee y Om, 1996; Muñoz, 2007; Santamaría, Brage-Gil y Modrego, 2010). La literatura actual describe ampliamente las características y el impacto de los principales programas de financiación competitiva internacional (Galsworthy y McKee, 2013; Grimpe, 2012; Laudel, 2005, 2006), la magnitud de la eficacia de los equipos de trabajo en las organizaciones de I+D (Choi, Price y Vinokur, 2003; Lin, Yang, Arya, Huang y Li, 2005), y la influencia que las estructuras de apoyo organizativas pueden tener sobre los grupos de I+D (Kennedy, Loughry, Klammer y Beyerlein, 2009). Sin embargo, el análisis de los factores que influyen en la capacidad de los grupos nacionales de I+D en cuanto a la solicitud y consecución de estos fondos, parece no haberse estudiado en profundidad.

El objetivo de este estudio es identificar y analizar qué factores pueden tener una influencia significativa en el éxito de los grupos de investigación, respecto a la solicitud y obtención de fondos competitivos internacionales, en entidades públicas de I+D, en el campo de la Salud y la Biomedicina, prestando especial atención a la función que desempeñan las Oficinas de Gestión de Proyectos y los grupos de I+D en este tipo de organizaciones. La investigación se establece en el nivel jerárquico de los equipos de trabajo, como unidad de análisis, los cuales cuentan con Coordinadores o Jefes de Área para el adecuado desempeño de sus actividades de investigación habituales. Las Oficinas de Gestión de Proyectos se han considerado como estructuras organizativas de apoyo a las actividades de los equipos de I+D, analizando cómo estos departamentos promueven y pueden influir positivamente en el aumento de las solicitudes y consecución de proyectos competitivos de ámbito internacional del personal investigador.

El marco teórico del estudio está basado en el enfoque de la Visión Selectiva de la Atención (Barnett, 2008; Barreto y Patient, 2013; Cho y Hambrick, 2006; Kahneman, 1973; Kaplan, 2008; Ocasio, 1997, 2011), la Teoría de la Autodeterminación o Motivación en la empresa (Deci y Ryan, 1985a; Eby, Freeman, Rush y Lance, 1999; Gagné y Deci, 2005; Ryan y Deci, 2000; Thomas y Velthouse, 1990) y la perspectiva de la Contingencia (Drazin y Van de Ven, 1985; Lawrence y Lorsch, 1967; Thompson, 1967; Zeithaml, Varadarajany y Zeithaml, 1988). Partiendo de este desarrollo conceptual, intentamos abordar la brecha de la investigación planteada, introduciendo un modelo que mide tres conjuntos de hipótesis sobre las relaciones clave entre los actores que más directamente influyen en el éxito de los investigadores de organizaciones públicas de I+D, en cuanto a su solicitud (proactividad de grupos de I+D) y obtención (eficacia de los centros) de proyectos competitivos internacionales, así como la relación existente entre estas dos variables. En concreto, el modelo se centra en analizar el efecto que tienen las prioridades de los Jefes de las Áreas de I+D, los incentivos y motivaciones que puedan existir en las Oficinas de Gestión de Proyectos, y la carga de trabajo de estas Oficinas, en relación a la proactividad de los equipos de I+D y a la eficacia de las instituciones públicas de investigación, siendo el número de investigadores de los centros una variable de control.

METODOLOGÍA Y DATOS

El modelo planteado se basa en actividades de I+D desempeñadas en centros públicos españoles, en el campo de la Salud y la Biomedicina, puesto que estos ámbitos de investigación ilustran perfectamente los patrones de comportamiento de los modernos sistemas de I+D en Ciencia y Tecnología. Nuestro análisis se realiza, además, en centros públicos españoles de I+D sin ánimo de lucro, pues los datos disponibles sobre los últimos avances de I+D en España revelan que éste no es un país exitoso en términos de resultados innovadores de I+D y de propiedad intelectual, en comparación con otros estados miembros y en relación a su nivel de desarrollo económico (Informe COTEC, 2014), siendo una de las prioridades de la Estrategia Nacional española el refuerzo y la mejora de los actuales parámetros de internacionalización.

Para el análisis empírico, el modelo se probó tanto con datos secundarios como con datos primarios de 68 centros, mediante trabajo de campo a través de encuestas a los centros públicos de investigación españoles. Para ello se utilizaron diferentes tipos de cuestionarios dirigidos al Director de los Centros, a los Jefes o Responsables de las diferentes Áreas de Investigación, y al Responsable de la Oficina de Gestión de la Investigación, Transferencia de Tecnología o del Departamento de Gestión de Proyectos Internacionales.

El modelo de investigación se probó utilizando la técnica de mínimos cuadrados parciales (PLS), un método de modelación de ecuaciones estructurales basado en la varianza. Utilizamos PLS dado nuestro enfoque en la predicción de las construcciones de resultados conductuales, así como por tratarse de una muestra de tamaño reducido (Ching y Newsted, 1999).

PRINCIPALES RESULTADOS

Los resultados obtenidos muestran que las prioridades establecidas por los Jefes de las Áreas de I+D y la carga de trabajo que soportan las Oficinas de Gestión de la Investigación como estructuras de apoyo a los grupos, están significativamente asociadas a la proactividad que tienen los equipos de I+D para solicitar proyectos competitivos internacionales y la eficacia global del centro en cuanto a la obtención de los mismos. Además, nuestro análisis revela que la política de incentivos aplicada en las Oficinas de Gestión de Proyectos, está significativamente ligada a la proactividad de los equipos de I+D en cuanto a solitud de proyectos internacionales a las diferentes agencias de financiación, independientemente de cuál sea el número de investigaciones de los centros –tamaño de los centros–, que se toma como una variable de control.

En términos generales, nuestro estudio presenta nuevas evidencias empíricas de utilidad para los diferentes actores interesados (instituciones públicas de investigación, grupos de I+D, oficinas de gestión de proyectos, etc.), puesto que les permite tener una visión de algunas de las variables que determinan el éxito en la obtención de fondos competitivos internacionales. Este conocimiento puede permitirles llevar a cabo un análisis interno, implementando las medidas apropiadas para mejorar sus resultados en la captación de mayores fondos competitivos. De hecho, al analizar la relevancia de estos factores clave en términos de su influencia en el éxito a la hora de solicitar y conseguir proyectos competitivos dentro de las instituciones públicas españolas (su proactividad y eficacia), podemos ayudar a estos centros a mejorar su estrategia de investigación en general y, en particular, a los equipos de I+D para que asignen mejor y de manera más eficiente sus escasos recursos, obteniendo mayor éxito en la obtención de fondos externos. Los resultados obtenidos en este estudio también pueden ayudar a aclarar la situación española actual, de desempeño por debajo de las expectativas internacionales en términos de resultados de I+D, innovación y propiedad industrial/intelectual, pudiendo ser de aplicación a otros países europeos que muestren patrones similares de bajo rendimiento, y en beneficio de los sistemas de investigación nacionales, mediante la mejora de las oportunidades para obtener recursos de fondos competitivos, los cuales garanticen la sostenibilidad general de los sistemas nacionales de ciencia y tecnología.

Chapter 1

Introduction

Research and development (R&D) is one of the main contributors to sustainable growth in highly industrialized, knowledge-based economies. Government support for R&D activities is needed and fully endorsed, in contrast to public support in investment, production or commercial protection fields (Santamaría et al. 2010).

One of the basic guidelines of the Lisbon Strategy is the aim of improving the global competitiveness of the European Union (EU) by means of increasing and maximizing productive research and of transforming research into value added technologies and products. In fact, one of the greatest challenges for public policy is to find mechanisms that promote cooperation by provision of funding, and various funding programmes have been implemented in the international arena to encourage R&D efforts and research partnerships between private firms and public research organizations. Some examples are the successive European Framework Programmes (Santamaría et al. 2010), including the recent Horizon

2020 Programme for research and innovation, launched by the European Commission and which fund international R&D activities on a competitive basis (Galsworthy and McKee, 2013; Grimpe, 2012).

Within this frame, and especially considering the current prolonged economic downturn, the national funds allocated to R&D developments are limited and there is increasing competition among countries and between research groups to obtain funding. With restricted national resources for implementing R&D activities, and under this highly competitive situation, public research institutions need to acquire external financial support through the main international funding programmes, in order to achieve adequate outcomes and to guarantee their work operations and performance. The ability of R&D groups to gain funding on a competitive basis is a crucial factor in their stability and their organizations' survival in the medium and long term (Bazeley, 1998).

A comprehensive review of the literature makes patent the importance of different competitive funding programmes and how to make them more simple, equitable and accessible to the scientific community through high quality research project management activities within R&D centres. In addition, research management services within R&D centres contribute by helping research staff to create an institutional climate in which new developments become more visible to them (Gabriele, 1998; Kirby, 1992). Research Management Offices (RMO) provide assistance to meet the requirements of R&D groups and help new innovative technologies and research outcomes to reach the market and society (Connell, 2004; Kirkland, 2005; McCallister and Miller, 1993). In turbulent and competitive environments like the current one, the services provided by these departments have become important elements in the effective functioning of R&D centres, which depend on adequate and successful R&D project management (Huemann, Keegan and Turner, 2007).

The literature also highlights the magnitude of work groups' efficacy in the performance R&D organizations (Lin et al. 2003), and the influence that support from managerial structures can have on R&D work teams (Kennedy et al. 2009). However, the factors that determine researchers' proactivity and capacity to acquire competitive funds, and the role of both project management offices and the CEO or Top Management Team (TMT) in the success of R&D centres has been the subject of very little study.

Project managers have become a basic tool to achieve this purpose, and their role in the process of acquiring competitive funding is still under research. What constitutes a successful application to competitive calls and the implementation of this type of projects in close relation with R&D teams has received little attention in previous works. This gives rise to two major focus points for research: first due to the scarcity of research on the role of research managers and administrators as key players –supporting structures for R&D research groups– in successful fund acquisition (especially in the project pre-award phase); and second, the study of the structure of Research Management Offices and their internal organization, and how their efficacy may positively influence research groups' success when applying for sponsored projects. We have considered the way these structures promote and contribute to performance regarding international competitively funded projects.

In the framework of our study, proactivity has been associated with the efficiency or success of work teams within R&D entities in terms of applications to competitive calls by R&D work groups to gain international competitive funding. The efficacy of research centres has therefore been linked to success in the acquisition of international competitive projects from main European funding programmes. We assume there is a direct relationship between the proactivity of R&D groups –international projects applied for– and the efficacy of the centre –the internationally funded projects granted–, since the higher the number of projects R&D groups apply for, the higher the amount of funds they will be able to obtain from the European agencies. From this perspective, we have considered different factors which previous studies have shown to influence the efficacy of work teams' and which may also encourage the efficacy of R&D groups within public research organizations by means of international competitive fund acquisition, providing their organizations with a sustained competitive advantage (Barney, 1991).

After an extensive review of the literature to confirm the relevance of acquiring funds on a competitive basis, as well as the general factors that improve efficacy in terms of the successful obtaining of funding and the different actors in R&D institutions –Directors or CEOs, Project Management Offices and R&D work teams– we have analysed the impact the structure of work teams can have on performance and the relations between them, together with other factors of work groups' efficacy. Following this extensive exploratory analysis, we next focused on the specific factors associated to the key players who are essential for the efficacy of R&D entities in obtaining competitive projects, since they have the capacity to apply for projects and to improve the chances of the research groups' success. In particular, we focused our attention on R&D work groups or scientific Research Areas, and on Research Management Offices, the departments for supporting research staff activities. Among others, these actors are implicated in the project acquisition process in a direct way, being responsible for the success of their entities in the international competitive funding arena.

The main contribution of this study is to present a model that proposes different factors that influence researchers' results in competitive funding acquisition within public R&D centres. The study highlights the importance of internal factors, and how they can be influenced by research groups and managerial structures within R&D organizations. The study analyses the way these factors and structures influence an organization's performance, measuring the proactivity of R&D groups with respect to the efficacy of their centres; namely, the competitive advantage that obtaining well-funded international projects gives to R&D organizations (more resources, competitiveness, improved economic performance, etc.) (Barney, 1991). In particular, the qualitative analysis undertaken has allowed us to investigate both the Heads of R&D Areas and their teams and Research Management Departments as key actors in the improvement of their organizations' proactivity and efficacy, and to explore the main factors that influence success in these types of activities.

The attention-based view of the firm (ABV) is one of the theories on which we have based our research model, since it holds that organizational decisions will vary in function of the issues and answers decision makers focus their attention on (Ocasio, 1997). Managers at firms usually deal with more information than they can cope with and process in their daily jobs (Simon, 1947). Besides, not all managers plan their activities in such a manner. Preferences in the temporal planning of TMT tasks could affect their strategic decision processes and, as a result, the organization's performance (Souitaris and Maestro, 2010). According to the ABV (Ocasio, 1997, 2011), an organization's attentional focus can be predicted by organizational variables such as culture, context, and economic resources. Attention is given to the identification and interpretation of the available stimuli, and managers inevitably discriminate in regard to the aspects of their environment that they focus on and respond to them.

The term "attention" can refer to amount and intensity. To attend is to apply oneself most to some task or activity, and selection is implicit, as there are always alternative activities one can perform, and applying oneself is a matter of degree (Li, Maggitti, Smith, Tesluk and Katila, 2010). Moreover, the ABV theory argues that 'although attention and interpretation can be conceptually distinguished, they are so intertwined that a distinction is not meaningful', and exploring the connection between environmental variations and managerial attention models is of great importance in understanding how firms function.

Attention can also be understood as a 'context-specific interpretation' (Kaplan, 2008), because it depends on characteristics of both the stimuli and the individual who is focusing his/her attention. For each manager, attention paid in a more intense way will depend on existing *attentional* drivers or structures (social, economic, cultural, or cognitive factors) that shape an organizational decision-makers allocation of time, effort, and attentional focus (Barnett, 2008; Ocasio, 1997). In summary, the ABV proposes that firm resources and capabilities regulate managers' attention to their interpretation of external events (Ocasio, 1997). In particular, firm resources and capabilities are expected to focus managers' attention on different aspects of an exogenous event, since contradictory aspects of the same stimuli can lead to different interpretations (Cho and Hambrick, 2006).

Barreto and Patient (2013) researched the capability perception, or feasibility dimension, and considered cognitive drivers beyond the previously mentioned attentional drivers. Souitaris and Maestro (2010) analysed the attention-based view of the firm, but from a similar perspective to the upper echelons theory, positing that organizational choices depend on what issues and answers decision-makers focus their attention on (Ocasio and Joseph, 2005). The two theories appear complementary, as it is logical that people have a limited capacity to attend to all information, action-alternatives and action consequences, which results in a limited capacity to be rational. The upper echelons theory suggests that organizational choices and outcomes are linked to the way top executives filter and process information from their environment (Hambrick, Finkelstein and Mooney, 2005; Hambrick and Mason, 1984). The way TMTs process environmental information and make their choices based on this process depends on their personal characteristics: i.e. their cognitive base and their values. In fact, the upper echelons theory focuses on the group characteristics of TMTs, and they will be significantly more predictive of organizational results than those of the CEO only (Hambrick and Mason, 1984). Since TMTs make strategic decisions, team-level attention structures should guide the organizational focus of attention. Extending this argument to the ABV criteria, top executives' values and cognition at the team level are reflected in their firms' strategic choices through the different ways managers process information (Hambrick and Mason, 1984). In this sense, the ABV would complement the upper echelons theory, because it expands the set of 'attention structures' or determinants of what decision makers focus their attention on. Apart from top managers' characteristics deriving from their personality and their past, it includes firm-level attention structures such as culture, rules, resources, and social relationships. The ABV highlights the importance of decision-making channels and processes as *mediating mechanisms* between attention structures and managerial focus of attention. A principal mechanism by which attention structures govern and distribute the attentional focus of decision-makers is via the channelling of decision-making (Ocasio, 1997).

Kahneman (1973) argued that the intensiveness aspect must be included in any analysis of attention. Cognitive research acknowledges that performance is only in part determined by the selected target of attention, since it also depends on one's attention intensity (Fiske and Taylor, 2008; Kahneman, 1973). Attention theory suggests that intensity affects results by assigning more attentional capacity to become aware of, interpret, and make sense of information and knowledge (Li et al. 2010), to examine the independent impact of attention selection and intensity, and to analyse how TMT search selection and search intensity work together to affect research innovation performance. Attention intensity (Kahneman, 1973), and other related concepts are critical factors that mediate the allocation of one's cognitive capacity to attention processes by making efforts in regards to other tasks and by persisting in the attention process over time (Kahneman, 1973; Ocasio, 2011).

This investigation is important in our study, since it will clarify the valuable role of managerial attention capacity in detecting, developing, and deploying certain types of activities regarding international competitive projects, and may help to advance an attention-based theory of such search. The Heads of the R&D Areas of the centres in our study must implement a large range of activities and have to apply themselves to some tasks or activities, selection being implicit in their periodic planning. Annual priorities set by the Heads of Areas in regard to the development of research activities by their teams –i.e. the intention of research staff to perform various R&D activities– will be a crucial issue to study, in order to identify how they perform and in which ways research organizations differ among themselves. Thus, to examine the proactivity of the R&D work groups in the different centres, we will focus on their intention to undertake certain R&D challenges and activities; in other words, the attention they pay to selected or prioritized activities. According to the ABV, the attention that Heads of R&D Areas give to certain research activities is the main determining factor of the proactivity of their R&D work groups and, by extension, the efficacy of their centres. Moreover, we aim to analyse to what extent the actions of the Head of the R&D Area to be developed by their teams are prioritized. If work teams are not able to focus their attention and intensity on competitive project applications –if there is not a clear prioritization of outcomes to be attended to by the Area– due to the fact they have to respond to a large number of urgent activities at the same time, the efficacy of the centre may be negatively affected (in a decrease in the number of project applications, inferior project quality and less scientific excellence, etc.). This approach is consistent with cognitive research, since attention consists of interconnected mechanisms that may work jointly to impact outcomes (Kahneman, 1973; Ocasio, 2011; Posner and Rothbard, 2007).

We also followed the **Self-Determination Theory (SDT)** approach (Deci and Ryan, 1985a; Ryan and Deci, 2000) to study the influence that incentives or motivations may have on the overall efficacy of research centres. SDT provides a useful approach to understand the motivational bases for effective organizational behaviour by explaining the association among extrinsic incentives, intrinsic motivation, and performance. This has been the dominant theory regarding intrinsic motivation, and provides an explanation of how intrinsic motivation boosts the direction, intensity, and persistence of motivated behaviour and its impact on performance. Intrinsic motivation should also be a strong predictor of performance, because quality-type jobs tend to require a higher valuation of personal investment and lower external control, both of which are theorized to be central to self-determination (Deci and Ryan, 2000; Ryan and Deci, 2000). Based on SDT, intrinsic motivation should predict performance in numerous contexts within organizations (Cerasoli, Nicklin and Ford, 2014).

According to the literature concerning human motivation, controlling incentives reduce intrinsic motivation and supporting incentives increase intrinsic motivation (Deci, Koestner and Ryan, 1999). The most renowned analysis of incentive contingency was carried out by SDT researchers, who distinguished four contingency types: engagement, completion, performance and non-contingent incentives. The categories define whether incentive was a mere engagement in the task, a mere completion of the work, attaining some level of achievement of the task, or not related at all to the task. According to Cerasoli et al. (2014), incentives can influence the predictive validity of intrinsic motivation. Moreover, intrinsic motivation remains a moderate-to-strong predictor of performance whether or not incentives are present. Incentives and intrinsic motivation may not be inevitability antagonistic, since they coexist, depending on the category of performance and the contingency of the incentive, with the combined effect of the two proving critical for performance.

Intrinsic motivation is an example of autonomous motivation. On the contrary, being controlled implies acting with a sense of stress or having to engage in the actions. SDT suggests that autonomous and controlled motivations differ in terms of their fundamental regulatory processes and their accompanying experiences, and it proposes that behaviours can be categorized by the degree to which they are autonomous as opposed to controlled. The grade of one's controlled motivation reflects the extent to which one feels coerced by external contingencies. SDT theorizes a self-determination range which spans from amotivation, or an absolute lack of self-determination, to intrinsic motivation, or a complete self-determination.

Studies of organizations have demonstrated that autonomy supportive (rather than controlling support) work environments and management methods encourage basic need satisfaction, intrinsic motivation, and full internalization of extrinsic motivation, and that this leads to persistence, effective performance, job satisfaction, positive work attitudes, organizational commitment, and psychological well-being (Gagné and Deci, 2005). Some environmental factors, such as job content, job context and work climate, and individual variances, such as antecedents of autonomous motivation together with work performance, have been associated with autonomous motivation. Thus, promoting autonomous extrinsic motivation in the workplace will enable the staff of an organization to experience meaningfulness, competence, self-determination, and impact in their jobs (Spreitzer, 1995; Thomas and Velthouse, 1990). The higher satisfaction of their basic psychological needs also promotes their autonomous motivation and commitment (Eby et al. 1999).

According to a previous analysis (Gagné and Deci, 2005), SDT has approached the processes through which extrinsic motivation can become autonomous, and research suggests that intrinsic motivation (based on interest) and autonomous extrinsic motivation (based on importance) are both related to performance, satisfaction, trust, and well-being in the workplace. In spite of this recognised importance of reward policies for increasing motivation and performance in organizations, there are few studies about organization rewards associated with international competitive project applications and acquisition in research institutions. For international competitive project applications and funds acquisition, meaning team performance in the scope of our research, we will focus our study on the motivation and rewards policy designed by the centres and addressed to the Research Management Offices as a support to R&D work groups, and will evaluate the potential increase of trust among team members, with the consequential improvement of their outcomes and performance in project achievement.

Our study also considers the **Contingency Approach**, since we have analysed the number and type of tasks developed by the centres' Research Management Departments; namely, the workload of this support structure, which is a contingency variable in our research model. The contingency theory-building steps involve three types of variables: contingency variables, response variables and performance variables (Zeithaml et al. 1988). In Strategic Management, Contingency Theory postulates that no strategy is generally superior, irrespective of the organizational context, and that there is not a best way to organize, since this will depend on the contextual conditions under which activities are developed (Laurence and Lorsch, 1967; Thompson, 1967). It emphasises the significance of situational influences on entities' management, and questions the existence of a unique, optimum way to organise. Nowadays, this contingency approach dominates theory and research in management literature (Boyd, Haynes, Hitt, Bergh and Ketchen, 2012).

The contingency approach to management establishes that organizations, persons and situations vary and change over time. Thus, the appropriate things to do will depend on a complex diversity of crucial environmental and internal contingencies. Successful organizations not only enjoy a correct 'fit' with the environment but also between its subsystems, and needs are better fulfilled when the entity is appropriately designed and the management style is suitable for the developed tasks and for the nature of the work teams.

According to Thompson (1967), whose studies in the area of technology's effect on organization have been of major influence, organizations that experience similar technological problems will display analogous behaviour. Therefore, the contingency approach assumes that common solutions and principles cannot be applied to organizations. What managers do in practice is contingent to a certain extent on circumstances or situations. In fact, the effectiveness of a range of managerial practices, styles, techniques, and functions will differ according to the particular conditions of a current situation. The main determinants of the contingency approach are related to the external and internal environments of the organization.

The Contingency Theory dominates scholarly studies of organizational behaviour, design, performance, planning and management strategy, and vary widely in subject matter, but it has the common proposition that an organizational outcome is the consequence of a "fit" or match between two or more factors. According to Drazin and Van de Ven (1985), Hofer (1975) and Venkatraman (1989), a factor common to all contingency approaches is the assumption that performance is a consequence of the fit between several factors. Lawrence and Lorsch (1967) proposed that organizational units operating in differing environments develop different internal unit characteristics, and that the greater the internal differences, the greater the need for coordination between them. Therefore, there can be broad variations in effectiveness, and these variations will depend on the successful matching of contingency factors with internal organisational designs, which permit adequate responses to the environment.

We have seen that, in a general sense, contingency theories emphasize the multivariate nature of organizations and attempt to explain how they operate under varying conditions and circumstances. Some behavioural theory contends that there is no one best way of organizing and that an organizational style which is effective in some situations may not be successful in others (Fiedler, 1964). The optimal organization style is contingent upon various internal and external constraints, and, in our study, the workload of Research Management Offices is an internal constraint. This workload has been defined as the amount of activities research managers develop to assist R&D staff in the best possible way; in other words, the amount and nature of services they provide and the professionalized degree to which they assist and support research groups –which will vary depending on the number of people work in the Research Management Office/ Transfer of Technology Office– in order to guarantee a proper service to researchers. This is due to the fact the services provided to the R&D groups are tasks of these offices, but can vary in their magnitude and the extent to which they focus adequately on the explicit needs of the demands of research groups depending on the number of people who implement research management activities and work in the department. Indeed, to equal priorities established by the Heads of R&D Areas and equal incentives offered to research managers, the workload will prevent or facilitate the implementation of the diverse tasks of the office. The workload assumed by Research Management Offices will then impose behavioural conditions and will influence R&D groups' proactivity and the centre's global efficacy.

With reference to the variables described above, we introduce a novel theoretical model focused on R&D activities in public non-profit-making research centres in the areas of Health and Biomedicine in Spain, since these fields perfectly illustrate current trends in modern Science and Technology R&D systems. Records reveal that Spain is relatively unsuccessful in terms of R&D results and industrial/ intellectual property performance in comparison with other European Member States (Informe COTEC, 2014). This is significant, as according to expert panels of the European Commission, the expansion of R&D is essential for Spain's success and future progress, and for its economic public policies. Measures to improve Spain's performance in terms of internationalisation have been introduced in project and institutional funding mechanisms as part of the latest European Union recommendations. At present, Spain performs below international expectations in terms of R&D, innovation and intellectual property outcomes (European Commission, 2014), and so one of the priorities of the Spanish National Strategy is to reinforce internationalisation parameters. The results obtained in our study may help to clarify the root of inconsistencies in the Spanish case, and could also be useful for other European countries with comparable models. Moreover, we hope our findings will enable R&D entities to become more successful in obtaining external competitive funding, thereby improving the performance of the overall national public Science and Technology System.

The results of this study offer insight to different interested parties, including R&D institutions, R&D groups, and Research Management Offices, regarding some of the variables that determine success in obtaining international competitive funds, thus allowing them to carry out an internal analysis and, by implementing the appropriate measures, to substantially improve their performance in obtaining and securing said funding. In fact, by analysing the relative relevance of these factors in terms of their influence on success in obtaining funds (their proactivity and resulting efficacy), we can help R&D centres to improve their research strategy in general, and that of research groups in particular, so that they will assign their resources better and more efficiently and become more successful in obtaining external funds.

The thesis is structured in seven sections. Section 1 describes the general framework of competitive fund acquisition, and the external and internal factors within R&D organizations that may influence their performance in this respect. Section 2 offers an analysis of specific internal factors, including the support researchers and research managers obtain from the CEO and TMT within their organizations. We also analyse the role of Research Management Offices in public R&D institutions and the services they provide to research staff. This section concludes with an analysis of the general internal factors that affect work groups' efficacy in R&D institutions, which is likely to also affect the overall performance of their organization. Sections 4 and 5 focus on the key factors and players of competitive fund acquisition within R&D centres –work teams and research managers– and proposes a theoretical model to describe relations between the different variables of the study, the research questions raised and the methodology of how the investigation has been carried out. Section 6 presents the data analysis and results obtained, including descriptive statistics, correlation analysis of questionnaires, the analysis of measurement instruments and the research structural model test. Section 7 is the discussion and conclusions, including limitations of the study and future research lines.

Chapter 2

General framework of competitive fund acquisition

Public sector research is carried out in a diversity of organizations, like universities, non-university research organizations for general or specific functions, and government-laboratories to support policy formation and implementation. These entities perform diverse functions like the advancement of knowledge, the support of policy formation and implementation, the support of public welfare like health, environment, public safety, etc., the support of economic development including technology transfer, and the development of programme to build up and support prestige activities and capabilities in the frontier science (Muñoz, 2007).

In the specific case of the Spanish R&D frame, most of the research conducted in Spain in the field of Health, is developed by research associations, public health research institutes, public administrations, companies and universities (CDTI, 2013). This means that a significant research conducted in Spain is implemented by public R&D entities, and public funding is crucial for maintaining their infrastructures, personnel and research developments along time. Moreover, R&D performance in public R&D centres is seen by society as a contribution to the progress of the national science and technology level, to the competitive capability of industries, or to social wellbeing (Lee and Om, 1996).

R&D activities are largely supported by public funds, as a key source for public institutions prosperity and maintenance, but Government funding for European public sector research has remained static in most countries in recent years, and public R&D entities have been encouraged to look for new basis of funds. Thus, additional resources have been provided by the European Commission Framework Programmes and Structural Funds and by industry (Galsworthy and McKee, 2013; Muñoz, 2007). In fact, in many European countries, public research has conventionally been funded through a combine of institutional funding and project-based, extramural research grants. To get these grants, scientists at public research entities can target different funding sources, including the government, research foundations, and industry. Furthermore, since the 1980s, the European Union (EU) has developed its own science, technology and innovation policy independent of the member states, with the creation of several Framework Programmes for Research and Technological Development (Grimpe, 2012).

The European Research Area (ERA) main objective, who was conceived as a *key driver of knowledge generation*, was endorsed by the European Council and is fixed in the 2007 Treaty of Lisbon. It aim to achieve a unified research area in which researchers, scientific knowledge and technology circulate freely and through which the European Union and its Member States strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address grand challenges. The ERA was created to achieve a genuine single market for knowledge, research and innovation (European Commission, 2014). In this sense, the Sixth and the Seventh Framework Programmes (6th FP & 7th FP) corresponded to the implementation of the ERA, willing to bund resources for RTD to generate a structure of scientific excellence that could compete with those of the U.S.A. and Japan (Kalisz and Aluchna, 2012; Young 2015). In order to achieve this objective, the 6th FP and the 7th FP developed large funding instruments for bringing together the scientific elite from various countries, and they became widely used instruments (Grimpe, 2012). In addition, improving the quality of research and innovation strategy development and the policy-making process for a more effective nation research systems, is one of the current three reform axes identified by the European Commission in its communication on Research and Innovation as sources of renewed growth, in rider to raise the quality of public spending on research and innovation.

If we analyse the figures invested in the promotion of research, we will realize the importance of the EU Research Policies. According to the 7th FP progress report, during the period 2007-2013 the Structural Fund has allocated an amount of € 86 billion to support innovation in a broad sense, while the allocation for core RTDI amounts to € 50 billion. It also has to be noted that during the same period, the funding available under Competitive and Innovation Programme (CIP) is quantified in € 3.6 billion. The purpose of this significant financing line in research is to set the basis for developing and boosting a European based research network and a knowledge based economy that would focus in bringing forward research activities and new technologies, and therefore move the whole economy, on the medium and long term, into a new era (CDTI, 2009).

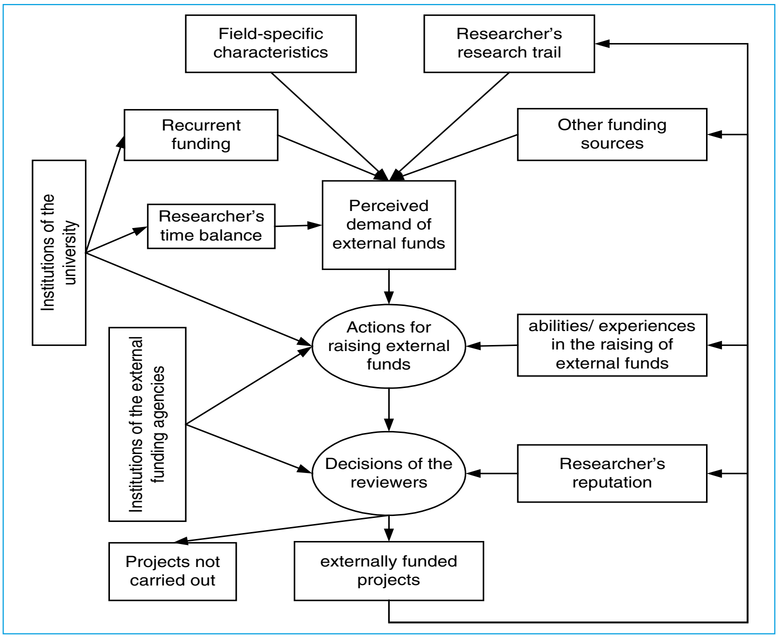
Under a rapidly changing and highly competitive environment, only the best groups and research programmes are able to obtain the required funds and hence to survive. For this reason, the capacity of national research groups for obtaining funds in a competitive basis is a key factor for the group survival and, hence, their R&D organizations. This natural selection of R&D projects will also cater to guarantee that the allocation of resources is distributed in the most efficient way.

The diversity of funding arrangements for public research are the model in which research grants for research organizations are allocated on the basis of competitive peer review. These competitive grants complete their core funding, which covers salaries costs, assumes that a proportion of the time of academic professors is dedicated to research and funds research infrastructure. Another approach is the block grant system, which gives researchers in relevant universities, research institutes and government laboratories a degree of freedom in deciding on the internal funding allocation. The 'block grant' system is also steadily declining in favour of competitive applications for grants (Muñoz, 2007).

Some factors within R&D public institutions do influence the competitive funding acquisition success and, therefore, their knowledge and better understanding is a key issue for the entirely public R&D system, who may benefit from this knowledge and improve their chances of obtaining resources among the available but limited funds. As far as we have analysed recent available information, no research has been conducted in literature about these key success factors, being in our opinion a crucial issue for the current Spanish science and technology system sustainability and survival.

Researchers' success in acquiring external funds depends on many variables, which can be classified as external and internal factors. Both types of factors will determine the quality of the research proposal, the likelihood for the research projects to be fundable and hence the chances of scientists for acquiring external funds (Laudel, 2005). The determining criterion to classify these factors is the possibility of being influenced and changed by researchers and by the persons responsible of the research activities developed within their organizations. While external factors are exogenous variables that are given and cannot be modified by researchers, internal factors have a stronger endogenous component and relate with the structure of the organization, the work framework, the behaviour and relationships among researchers, and thus can be altered by the organization, resulting in a better performance while obtaining external funds.

Figure 1. Acquisition of External Funds – Assumed Variables and Causal Relationships



Source: *Laudel (2006)*

2.1. EXTERNAL FACTORS

2.1.1. The Funding Sources

Researches will look for those funding sources that match with their research topic, whose proposal eligibility criteria can be met by them as applicants, and whose terms of funding meet the funding needs of the project. The availability of funding sources depends on the diversity of funding landscape, the availability of collaborators, the epistemic room for manoeuvre and the integration in the scientific community (Laudel, 2005).

Scientists can approach different funding sources depending on their needs, chosen a specific research topic and certain requirements, but also depending on the possible external funding sources. Among many others, the European research programme for 2007–2013 developed different financial mechanisms for strengthening the ERA, including national networks (ERA-nets), Joint Programming (sharing national thematic programmes) and Infrastructures (developing shared facilities and databases) (McCarthy and Zeegers Paget, 2013).

The research topic can be funded by a specific programme, which usually differs from others in their characteristics and their fixed amount of funds. In fact, different research fields differ significantly in the amount of money they distribute by competitive grants, the financial autonomy they offer, the amount of collaborators needed to develop the project, the project proposal, etc. (Laudel, 2005). Basic research projects, for example, are different from applied research projects, which usually offer a narrow funding landscape and have less money available from external agencies than those large industry oriented projects sponsored by industry.

It has been mentioned that different schemes within a specific funding programme can be focused on collaborative research projects, and the availability of collaborators is a requirement to apply for such funds. This can be affected by the size and structure of the field, the existence or not of potential collaborators in that field of research, the research topic itself, and the high quality of the scientists developed work (that may attract partners to collaborate in consortium agreement).

2.1.2. The Funding Agencies and Reviewers Process

Companies, public and private institutions and countries aiming to improve their national competitiveness, have R&D as one of the key factors for their sustainable and successful operational activities. But the limited budgets and resources make that not all R&D projects can be conducted. This fact makes project ranking and selection an important task (Chian and Hwei-Lan, 2011).

Previous studies have focused on evaluating R&D programmes effectiveness and the influence on private R&D efforts, but few works has looked at the criteria used by government evaluators to select projects. Knowledge of these criteria is vital since they reflect the real objectives of policy makers and they determine the characteristics of those projects currently implemented or developed and the results obtained by them. They can also affect the responses to upcoming calls and the definition and fillings of project proposals (Santamaría et al. 2010).

International funding agencies have a number of perspectives for evaluating proposals. A proposal can be evaluated in terms of reasonableness, attractiveness, responsiveness, competitiveness, and innovativeness. Conceptually, each perspective is represented by multiple criteria measured by a number of indicators. In the literature, several approaches have been proposed for evaluating and selecting projects. The funding agencies rely on the subjective evaluations of peer reviewers, and proposals with scores greater than a threshold value are approved for funding (Chian and Hwei-Lan, 2011).

Excellence of the proposed research is the primary criterion on which awards are made. International funding agencies relies on a combination of peer review and panel assessments in determining excellence, with applications for funding needing to pass through several stages of review to become successful. Assessors are asked to make written comment, to rate specified aspects of the project (originality, soundness of research plan, scientific merit, and potential) and the track record of each investigator on a seven point scale, and to assign percentile rankings to the quality of the project and the researcher or research team in order to evaluate if they will be able to conduct the project (Bazeley, 1998).

Variables considered when evaluating proposals include age, gender, type and status of position, institutional base, previous grants history and publication records of the applicants. With a peer review system, it is also possible that those already known to assessors and panels will more easily obtain favourable assessments and funding than those who are less well recognised and/or who are without obvious credentials.

Merit of the proposed research and the quality of track record of an applicant are of critical importance in determining who wins a grant. When external assessors and discipline panels are evaluating the relative capacity of an investigator to undertake excellent research, it would appear that the academic status of the applicant impacts on the assessments by both, in addition to a consideration of the applicant's track record in grants and publications and the merit of the proposal (Bazeley, 1998). This suggests that those who are not of professorial rank are likely to be comparatively less successful in winning funding, despite having an equivalent track record.

According to Squazzoni and Gandelli (2012), peer review is one of the most significant forces, which is responsible for science system behaviour, due to the fact it determines how all the resources of the science system, such as funds, careers and reputation, are allocated. As a matter of fact, the quality of reviewing is the leading force which can change funding allocation in science, jointly with competition (Squazzoni and Gandelli, 2012). Moreover, peer review has been shown in literature to be subject to diverse influences apparently associated with the academic status of the applicant, with the possible exception of institutional affiliation. Being known as a professor and having had previous competitive funding for the proposed project increases the likelihood of success and the theory of accumulative advantage would appear to some degree for applicants to international large grants schemes (Bazeley, 1998). According to literature, review by peers (independent assessors) appeared to be more subject to influence than review by panels.

It have been seen that institutional rules set by the different funding agencies and the decision behavioural of the reviewers influence the project proposal success. Therefore, scientific capability to adapt the proposal contents for excellent proposals also favours competitive grant success.

The epistemic room for manoeuvre also conditions success in getting research funds, since scientists can adapt their current used methods and research objects to a larger variety of available external funds.

2.1.3. The Enabling Funds

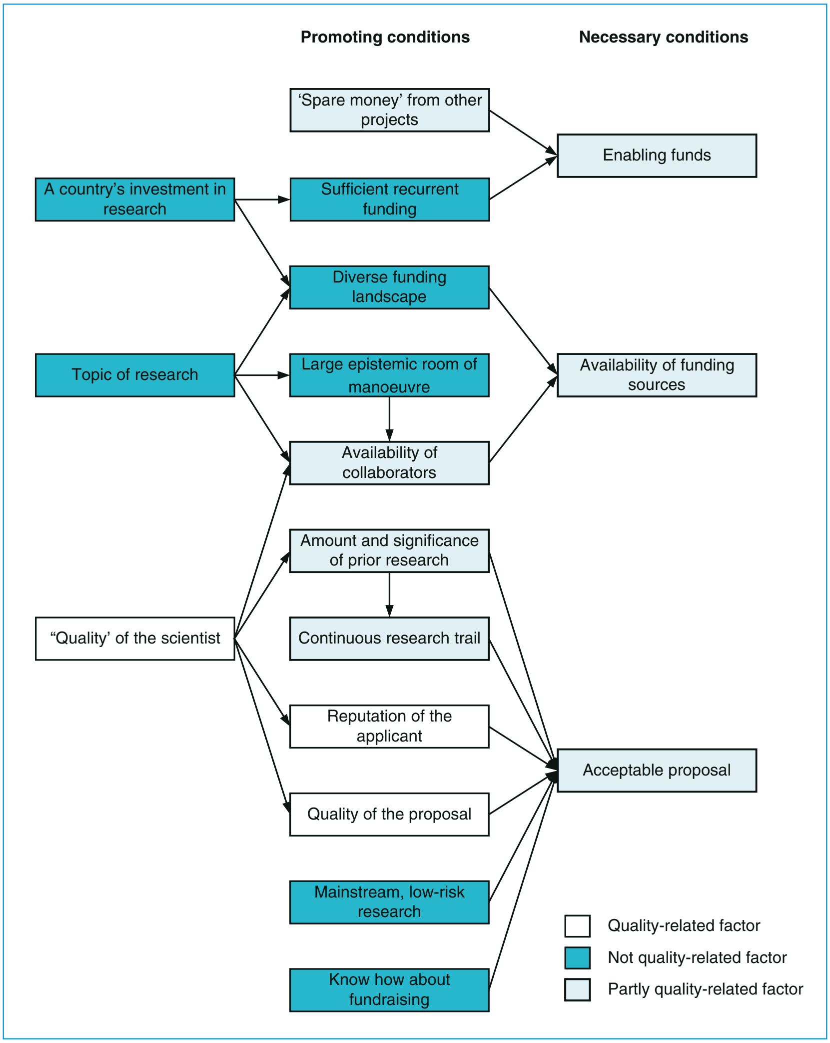
The country general investment in RTD activities can boost or limit the amount of money available for research competitive grants funding. When there is an insufficient amount of funds to support grant preparations and/or to guarantee excellent projects development, there is a limitation that influences all this process. But during current years, the contribution of research grants has increased appreciably compared to institutional funding. The policy rationale for this development is the idea that competitive funding of public R&D provides production incentives, which raises efficiency and productivity compared to traditional funding mechanisms (Grimpe, 2012).

In research institutions, it is assumed that the amount of basic suppliers influence the possibility of acquiring external funding, because competitive grants do not usually cover all the research expenditures needed to develop a research project (Laudel, 2005). Thus, it is necessary for scientists to have extra money from other sources in order to face all project expenditures and successfully conduct the research work.

This money can come from recurrent money, which means the money the research groups have available for their daily research activities. This funding depends on the institution own research funds (see internal factors) and also of the State wealth that funds public institutions. Due to the current situation of economic crisis in Europe and especially in Spain, it is every time more difficult for scientists to obtain recurrent funds from their institutions. In fact, Spanish research directors may lack of authorization in terms of strategic planning of human resources, and budgetary cuts leave few resources available to research units once salaries are paid (European Commission, 2014).

The necessary money to undertake a research project can also come from other externally funded projects. These projects can finance and complement part of the main granted project. The amount of this extra money depends on the available funds within the research centre, the amount of externally funded projects, the possible restrictions imposed by the funding agencies to spend them, and the quality of the work (the competition with other research groups also applying for free money within the same institution). This free external money can be used to prepare project proposals too, or to start new research lines that will contribute to increase quality and reputation of the research group and will affect their possibilities of getting new funds.

Figure 2. Necessary and Promoting Conditions of Fund Acquisition



Source: *Laudel (2006)*

2.2. INTERNAL FACTORS

2.2.1. The Project Proposal

In project selection within an RTD organization, project selection criteria reflect the goals and missions of an organization. They affect the characteristics of proposed, selected and conducted projects, and restrict and determine the output of R&D efforts. Thus, researchers learn the required research directions by detecting the projects, with specific characteristics, that are accepted and those ones that are rejected. Therefore, R&D project selection criteria facilitate the identification process among researchers, evaluators and decision makers in selecting R&D projects (Lee and Om, 1996).

Once the project has been selected from the R&D portfolio, the quality in the presentation and contents of a proposal is a fundamental requisite to obtain competitive funds because is a criterion always used by proposal reviewers. A project proposal is fundable only when it has high good quality and reflects a feasible project. Thus, not only the intrinsical characteristics of the project itself are a crucial key factor for success in grant application processes; furthermore, a fundable proposal has to fulfil all the formal and administrative requirements of the funding entity.

Following previous argument, researchers looking for funding to develop research, face the tasks of preparing a high quality proposal and demonstrating their capacity to conduct the proposed project. Scientists need to demonstrate the progressive nature of their research programme and their capabilities to build cumulatively upon the literature and their own preliminary studies. In this sense, young researchers shall have fewer preliminary figures, and the way to write a winning proposal may appear less clear to them (Proctor, Powell, Baumann and Santens, 2012). In the particular case of Health R&D field, to make a convincing argument for scientific innovation and public health implication, a research grant application must have potential beyond reducing a quality distance and executing a particular evidence-based healthcare exercise.

2.2.2. The Research Scientist Career

The experience, expertise and reputation of the scientists who apply for research grants are also needed for a proposal to become successful. Scientists who can proof have delivered relevant work on the research field of the proposal, are better considered by peer reviewers that other with no previous empirical work conducted, since evaluators use to prioritize mainstream low-risk (already known research) and disciplinary research (Laudel, 2005). This prior work is possible to get via other research projects and the available recurrent money to develop them. Prior work is then increased by scientist's research trial, and it also increases scientist's general reputation and track record (references to one prior research), affecting positively proposals success.

Both professorial status and being in a research-only position had a strong relationship to success in winning funding. In team projects, the addition of a professor to a team is associated with an increase in the rate of success, and teams which include a research fellow or a reader are as well advantaged (Bazeley, 1998).

The quality of the project but the whole of a scientist's former research is assessed by evaluators. Thus, scientists with certain decision-making power, with an established network of formal and informal relationships, and well considered by their community for their good research, will have better chances to obtain funds.

Course research is one of the key factors to build scientist reputation, and publication records usually measure this factor. Publication and citation data in Web of Science as data source is one indicator of scientists' reputations in Life Sciences Health research field. Researchers need to get projects funded in order to research and to succeed in publication, thus obtaining research trial and reputation which also depends on the amount of funding projects they get by external agencies.

Since published output is almost undisputed among researchers and academics as a primary indicator of research capacity, successful applicants in general had been solo or first author for more books and more articles and chapters than were unsuccessful applicants (Bazeley, 1998). We assume that since reviewers use applicants' publications record as an assessment criterion, externally funded researchers are more likely to publish than others (Laudel, 2006), and will have more chances to get competitive funds. By extension, R&D centres with demonstrated scientific excellence background will get more resources than others still in their way of building a reputation. It has been also demonstrated that Framework Programme competitive projects involved the contribution of excellent scientists, measured in terms of publications and received citations (Grimpe, 2012).

2.2.3. Collaborative Networks

Collaborative research is defined as collaboration between research centres and external organizations (Örtel, 2004). In the latest years, a common trend concerns the increase in research collaboration observed for most countries. Collaborations by the various sectors of public research entities within countries, as well as collaboration between countries have occurred.

Scientific collaboration in an international environment takes place among partners, such as research institutes and other public-private entities, to apply for research grants and together perform projects. The highest motivation for organizations and individual R&D groups to cooperate is to enable knowledge and resource sharing to successfully perform research projects (Schall, 2014). The success of research and innovation is based on the right equilibrium between cooperation and competition. Therefore, establishment of alliances and associations are needed, and may be influenced by partners' reputation.

R&D collaboration is a form of strategic alliance. Consequently, it is expected that its members shall face challenges in both R&D and alliance management (Morandi, 2013). In fact, during the execution of an R&D contract, the management system consists of coordination and control activities, which transform the collaborative arrangement into a productive and effective shared performance of the research project, safeguarding partners from conflicts. Management challenges can change also according to the partnership authority, the number of partners, the project team size and partners' geographical proximity.

Cooperative projects with participation of international collaborators are nowadays a requisite in most of externally funded projects, especially in large RTD projects. In fact, international collaboration in research is characterised by an important increase in inter-European collaborations and the significance of participating in EU R&D programmes to all European country, independently of its size or development situation of its R&D system (Muñoz, 2007).

Each research project uses to be linked to a certain topic that fixes the context of the future performed alliance. Research institutions are involved in projects by having certain roles. Roles comprise project coordinator and project partner. In addition to the participation relation, a weighted edge is created from the project to the organization to depict the degree of involvement (Schall, 2014). More funding classically means that an entity can allocate more resources to the project and so develop more tasks.

The key factor for success in promoting collaborative research is to be proactive, establishing a central research management or Transfer of Technology Office (TTO) in the Centre, which may help in identifying potential partners and may act as a link between researchers and other institutions. Once the links are established, the critical factor is ensuring sustainability via managing the collaboration, and embedding the process in the research agenda (Örtel, 2004).

Therefore, a well-established network of potential partners and good relations in international research contexts will guarantee the availability of collaborators for work in international consortium, and will increase the possibilities of scientists in gaining competitive grants. In addition, and according to literature, funding is positively associated with collaboration and efficiency for RTD researchers. Funding cannot always be regarded as productivity obtaining, though it may allow scientists to more existing collaboration in ways that would otherwise be harder to get (Grimpe, 2012). Following this argument, the importance for scientist of prestige and recognition given by grants have been also probed, since international competitive grants facilitate opportunities that would not otherwise have been possible for them, like collaborations with leading researchers in their field, and establishing their own positions in their respective research communities (Bloch, Krogh Graversen and Pedersen, 2014).

2.2.4. Experience in International Projects

The current on-going trend from fixed to more variable research funding sources in European countries has increased competition for external grants in the last years. This implies that scientists need to develop funding strategies to be successful. Thus, scientists can also be assumed to select those grants for which they expect the highest gain. As virtually all funding bodies claim to apply competitive, merit-based selection procedures, common sense would put forward that the probability of receiving the grant would depend on the scientist's research productivity and quality (Grimpe, 2012). Following this argument, the larger experience the research scientists have in international competitive funded projects, the best way they will face the fulfilment of the diverse mechanisms for obtaining external funds, for applying with a good proposal, enlarge international partners relations and reinforce current collaborative networks (Laudel, 2006).

It attracting funds, the classic indicator of the fitness of a researcher is their track record or their ability to attract funding and obtain reasonable results from it (Bazeley, 1998). Having won previous grants is seen as evidence of an established record, while those scientists new to the research funding are expected to work in teams conducted by an established researcher, in order to increase their chances of getting competitive funds.

2.2.5. Research Group Structure

According to literature, differences across research centres groups in the proportion of staff at various academic levels and with extensive research experience, is likely to be having some effect on comparative success. Additionally, the comparative lack of research facilities has some influence and staff members' may lack of established networks as well (Bazeley, 1998).

The fact of whether a scientist leads a research group, as well as several institutional and disciplinary features, could determine the funding outcome (Grimpe, 2012). Literature findings has implications for the incentive effects in R&D teams, since it has been seen that including the head of the R&D group on the project application, considerably increases the chances of getting a competitive grant.

In regards to age, academics have the impression that a very large proportion of grants are going to established researchers over 50 years of age, and young researchers have most problems in obtaining grants (Bazeley, 1998). It has to do with researchers' reputation. Thus, younger researchers may benefit by applying for grants in association with an established researcher (like current funding programmes for emergent R&D groups and junior researchers), while established researchers would not be disadvantaged by the inclusion of younger researchers in their work teams.

In regards to gender, the differences that may exist are a reflection of the lack of seniority of women within the academic system (affecting rate of application in particular) rather than of any obvious biases in the grant assessment process (Bazeley, 1998).

Problems with respect to age and gender are occurring at the point of application: women and those under 40 years of age are appreciably underrepresented amongst applicants in comparison with their numbers in R&D centres and universities, so that it would appear that all but the most secure researchers in those and the extraordinarily resilient are discouraged from applying (Bazeley, 1998).

Applying for international research funding is a large hard-work, high time-consuming procedure that not always obtains the desired results. A key factor that plays an important role in funding acquisition is the internal composition and structural relationships of the research team (Laudel, 2006). The success of a research group is directly related to its organizational structure and to the values and attitudes of the research team members.

2.2.6. Researchers' Motivations and Values

Not just the extrinsical factors but other intrinsical variables, like researchers individual motivations and expectations, the work environment, the intra-team hierarchic structure, the availability to deal with a changing environment, among others, should be considered and worked out to articulate and give cohesion to a successful and motivated team.

Literature has shown that while research grants have a positive effect on the work performed under the grant itself, there are other secondary effects on RTD performance that positive effects scientific career progression. Thus, grants impact research careers, by heightened status, recognition, networking and other factors like middle channels, by boosting interaction, knowledge transfer and research, and by improving research organization competencies (Bloch et al. 2014). The central role of grants has been facilitating collaborations with leading researchers and setting up their own positions in R&D communities. Thus, potential indirect effects on research results through strengthened status and credit are possibly superior that the direct effects based on the results of grant R&D projects themselves.

Besides the need of getting funds to guarantee research continuity within research institutions, one of the motivations to encourage R&D among research teams is related to international competitive research funding. According to literature, international competitive research funding is generally regarded as the most prestigious source of research funding for academics and researchers, despite the fact that the amounts awarded are often significantly less than those available from industry or other granting agencies. Awards under such financial schemes are considered an essential part of the reward system of science because they confer status and trustworthiness to researchers, with the consequent benefits to both professional advancement and public research organizations funding (Bazeley, 1998). Specifically, researchers who perform well will become more self-confident than those ones who have performed well but under moderate demands, and they will engage in riskier strategic behaviours (Hambrick et al. 2005).

Nevertheless, serving as Principal Investigator (PI) on a research project can provide: increased autonomy and control over a scope of activities, the resources to be the best in a given research field, the funding to really help other persons, and the money to buy equipment, to hire assistance, or obtain other resources that will make the project more easy to accomplish (Blankinship, 1994). Although obtaining external funds is stressful, wining a competitive award can help a person achieve the goals associated with his or her personality.

To have funded projects to conduct indicates how active the research groups are in research. This is an important criterion in many universities and public research institutions for promotion and salary rise for professors, since an approved project implies that their proposals are attractive, innovative and can generate valuable results for their institutions. We can assume from this that intense motivation to enhance R&D institutions performance also could arise because of an alignment of researcher rewards with their institution performance. This observable fact is most pronounced in government offices and when the applicants are university professors and thus, may be an extra motivation for research groups to obtain competitive grants (Chian and Hwei-Lan, 2011).

Applying for international competitive grants implies a lot of time and diverse resources, thus increasing the workload researchers have to devote in their daily agendas to achieve uncertain and challenging results. Executive job demands are defined in literature as the degree to which a given executive experiences his or her job as difficult or challenging. According to this, a demanding job in R&D organizations is one that the researcher experiences as difficult or challenging. Job difficulty could be felt in various ways, including the amount of time the job requires, the degree to which the job is always on the executive's mind, the degree to which the executive feels ill-equipped to do the job, and the degree to which the executive believes that success at the job will be hard to achieve (Hambrick et al. 2005).

According to previous studies of job demands and satisfaction, increases in job demands cause workers to perform better and become more satisfied with their jobs, but only up to a point, beyond which performance and satisfaction decreases (Hambrick et al. 2005). Thus, the accumulative work researchers may feel due to additional work when applying for international funding, may have implications for the entire organization and its constituents. If job demands affect the nature of strategic decision-making or the researchers' leadership behaviours, then the organization's overall vitality and performance may be post in ways that should be considered.

The conditions that make difficult for a researcher to achieve a specific level of performance, and their motivations to fulfil their research work, arise from the environment and from the organization, in terms of resource limitations and complexity. The complexity of the organization's strategy and its structure is also a source of task challenges and influence researchers' motivations and values to fulfil certain tasks. Thus, researchers who are strongly motivated to improve the performance of their organizations may place more demands on themselves. They partially determine their own job demands. Researchers, who are aimed to achieve high performance levels, may experience large job demands, even if the other contextual forces are minimal or moderate (Hambrick et al. 2005). But, researchers who are under extremely great job demands will exhibit more extreme strategic behaviours and more irresolution in their behaviours than researchers who are under low or moderate job demands.

Aspirations to deliver maximum organizational performance may come from personality factors. It can come from aging or tenure effects too. Those researchers who are younger or starting their careers or jobs, may have more to prove and may feel under pressure to demonstrate their efficacy and to establish their reputation; those who have long tenures and records of success may be more inclined to be satisfied and work without pressure (Hambrick et al. 2005). In addition, some research coming from the upper echelons theory, highlights that the greater the job demands, the stronger relationship will be between executive characteristics (like age, etc.) and their strategic choices, hence organizational performance (Hambrick, 2007).

In regards to the motivation among research team members within R&D institutions, the greater a principal researcher's job demands, the greater will be the pressures sited on others members within the organization. This can affect the work environment, placing pressure on teams and encouraging additional challenging research works.

It has been seen that applying for international competitive grants has a hard work and it implies time and resources. The additional support that researchers may have from their R&D management offices may reduce their job demands in relation to competitive grants applications and management, increasing motivations and stimulating participation in new competitive applications.

2.2.7. The R&D Institution Supporting Resources

Another factor to be considered is the knowledge scientists have about the different available funding programmes, the knowledge of the formal rules of the funding schemes, and the ability they have to write a good project proposal (Laudel, 2006). It is also important for scientists to have the experience and time for writing proposals and for the required activity reports. For the preparation of the grant proposal and for reporting activities, a considerable amount of time is necessary. The amount of time a researcher can devote to such administrative activities depends on the time they have to spend on non-research activities (like teaching and other duties) at the research institution.

In order to minimize the time the researchers have to devote to non-research activities, many research centres have specialized staff, or even departments, that assume the administrative work and procedures associated with obtaining external funds (Blankinship, 1994) and typically would take care of searching the potential funding sources, elaborating the required documents to answer a call, handling the communication with the financing agencies and institutions, contacting and negotiating with potential partners, preparing the required interim and final reports, follow up of the deadlines and deliveries, etc.

It has to be highlighted that participating into institutional financing programmes, e.g. Horizon 2020 Programme implies highly bureaucratic procedures and requires expertise and skills in various legal and administrative fields. Releasing the researches from this duty will allow them to conduct their main research activity and will avoid wasting time and efforts. Therefore, the existence of this type of supporting staff or departments is critical not only for obtaining external resources, but also for guaranteeing the quality of the researcher's activity.

Most institutions have different type of incentives to actively pursue external funds or other collaborative external activity. The most common incentives within R&D entities are departmental incentives (usually from projects indirect costs recovered), career incentives and personal incentives, which can be used to increase research group facilities, provide research assistance, etc. (Kirkland, 2005).

R&D centres CEOs can reward scientists per competitive fund acquisition, using recurrent funding for gratifying the most successful research units, in order to stimulate the acquisition of the limited external funds (Laudel, 2005). These rewards can also be used to boost emergent potential groups with small track record and lack of experience in proposal applying, trying to get them into the system, and supporting those strategic areas of excellence, which are not getting funds by external agencies.

2.3. RELEVANT CONCLUSIONS

Internal success factors in competitive funding acquisitions can be influenced by the researchers or by the research institutions, and are the ones that will be analysed in this study. We will examine the impact internal factors have in obtaining external competitive funds. By studying the relative importance of these variables, we can help organizations to define their scientific strategy, so they can assign their assets in a more efficient way and become more successful in the competitively obtainment of external resources.

It has been seen that the research topic funded by a specific programme usually differs from others, in their characteristics and even their fixed amount of funds. In order to specify our topic of study, we will focus our research study in the field of Heath and Biomedical sciences.

According to previous studies, biotechnology and related fields like health research may be a good instrument for analysing the evolution of institutions and programmes to face new challenges and new environments for the development of science and technology. Moreover, resource allocation in these fields usually takes place on a highly competitive environment, most researchers are employed on temporary contracts or on a research project-by-project basis and a big amount of research activities are funded through competitive financial mechanisms (Muñoz, 2007). Thus, this study will be focused in research activities conducted by R&D centres in the area of Health within the Life Sciences field.

Following the available results in R&D funds obtained from the 7thFramework Programme (7th FP) in 2012, Spain was the sixth country in return, together with The Netherlands, with 8.3% EU-27 (7.4% of total), behind Germany (18.2% EU-27), the United Kingdom (16.2% EU-27), France (12.1% EU-27) and Italy (9.3% EU-27). Total 7th FP grants allocated to Spanish researchers represented about 3.212 M€, namely 19.6% of total public funding in Spain (2007-2012) (European Commission, 2014). These results were the best scored by Spain so far, and represented a significant progress for Spain over the previous years, which helped to achieve a return of 8.3% EU-27 throughout the 7th FP (earnings from 2007 to 2012; CDTI, 2013). But we are still far away from achieving the results reached by other European leading countries, in terms of number of coordinated projects and amount of funds raised.

Furthermore, looking at the distribution of return by Spanish Regions in 2012, Catalonia (40.8%) and Madrid (31.4%) stands, followed far behind by Castilla La Mancha (8.9%), the Valencia Region (4.7%) and Navarra (4.3 %), among others (CDTI, 2012).

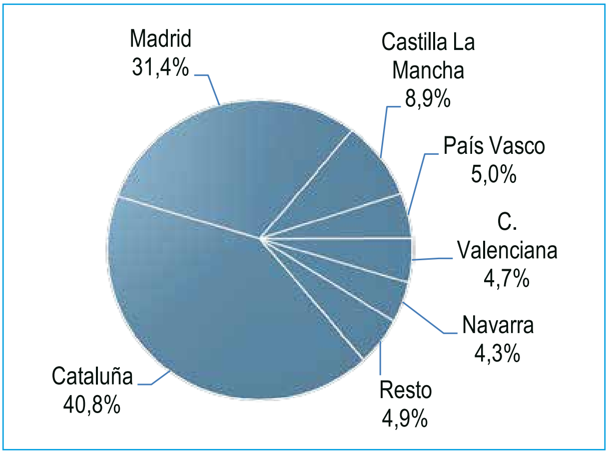
Table 1. Return of Funds of Spanish Participation in 7th Framework Programme–Health Theme

Año	Retorno (M€)	Retorno (%UE-27)
2007	24,0	4,2%
2008	32,1	6,4%
2009	29,7	5,5%
2010	30,0	5,4%
2011	61,2	7,9%
2012	42,2	6,2%
Total	**219,3**	**6,1%**

Source: *CDTI (2012)*

These figures show clearly that Spain can improve its ranking of R&D funds obtained within the EU-27, and that Valencia Region can also increase its relative weight within Spain. The analysis of the internal factors that determine the assignment of R&D funds and influence the success of the applicants can play a key role in achieving this goal, both for Spain and for less successful Regions like the Valencia one.

Graphic 1. Distribution of 7th FP Health Theme Return by main Spanish Regions in 2012



Source: *CDTI (2012)*

In December 2013, the EU officially launched Horizon 2020 Programme, the new R&D funding programme for R&D of the European Union for the period 2014-2020. H2020 integrates all key elements of the Research and Development and Innovation (R&D&I), from know-ledge generation until closer to the market activities (Informe COTEC, 2014). H2020 also unifies funding, objectives and activities of previous Framework Programmes for R&D, the Competitiveness and Innovation Programme (CIP), and the European Institute of Innovation and Technology (EIT) (Galsworthy and McKee, 2013).

Given the complexity of conducting, within the frame of this research work, a thorough study on a worldwide or even European scale, to find out the variables that influence the results of R&D and how these variables determine the success of a given R&D centre to successfully acquire international competitive funds, we have decided to focus this study in Spain, since Spanish case shows a singular behaviour.

Spain has enjoyed a fast developing economy and remarkable Gross Domestic Product (GDP) growth since it joined the EU until year 2008. Despite this economic development, that consequently should have boosted the R&D and Intellectual Property (IP) development, Spain has remained a low developed country in these fields (Informe COTEC, 2014). Moreover, Spain is one of the EU Member States that has been most aggrieved by the financial and economic crisis started in 2008. At present, the competitiveness of the Spanish economy is still at risk. The last available data point to the economy remaining in recession in 2013 (with real GDP falling by 1.5%) and unemployment rate reaching a peak of 27% (European Commission 2014). The regional difference is evident in R&I potential and capabilities too, with four regions showing a higher R&I intensity (Madrid, Catalonia, País Vasco and Navarra) than the rest of the country. In this context, improving R&D&I have been pointed by EU experts as a key element to overcome the crisis in a sustainable way.

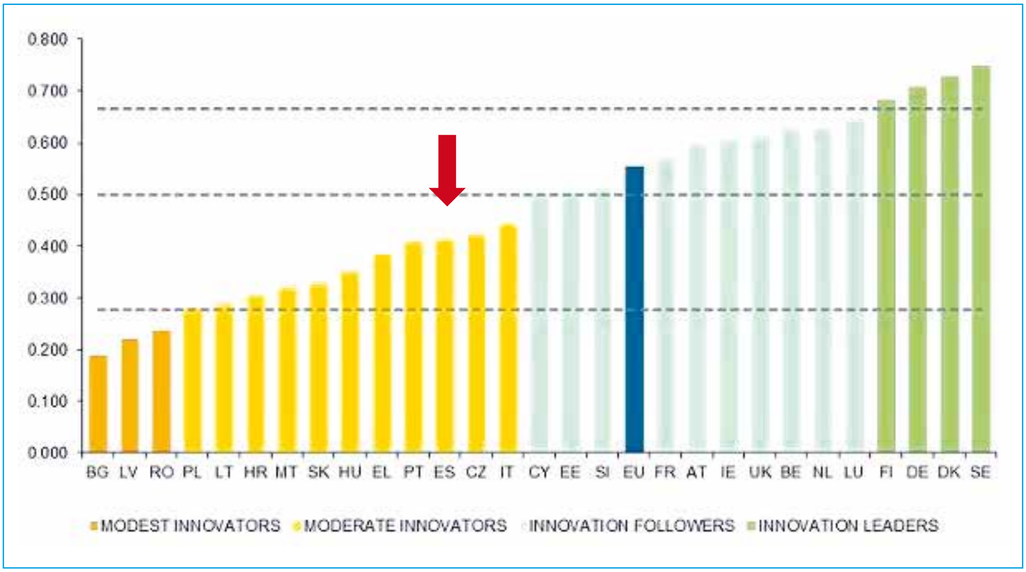
Considering that the GDP is a valid indicator of welfare and economic development, according to the 2013 World Bank ranking, Spain per capita GDP may be comparable to per capita GDP levels of countries like Italy and France. It would be logical to infer that the levels of R&D and IP would be also similar with these countries. But the R&D expenditure performed in Spain in 2012 was 13.392 M€ (1.30% of the GDP), 5.6% less compared to the

14.184 M€ R&D executed in 2011 (1.36% of GDP). This indicator continue decreasing, being even lower than in 2008, even though the contraction of the Spanish GDP. The Spanish effort was just equivalent to 2/3 of the average expenditure (1.97%) of the total EU-28, and just over half the 2.40% average of the OECD. The effort reduction of last years has affected both public and private sectors, being the public sector the most deteriorated (Informe COTEC, 2014). Other indicators, like the expenditure on current Euros, remained in 2012 below the peaks achieved in 2008.

In 2012, the costs divergence between the Spanish R&D expenditure and the countries usually taken as a reference, still remained. Since 2008, the Spanish R&D expenditure had dropped to 4.2% in 2012, while in all five countries (Germany, France, Italy, UK and Poland) it grew by 16.4%. The evolution of the R&D expenditure relative to GDP was also different. In 2012, the gap between Spain averages and the OECD and EU-28 was 1.10 and 0.66 percentage points, while in 2010 it was 0.94 and 0.51 points respectively. In 2012 the R&D expenditure per capita was 64% of the average of those five countries, while in 2010 it was 73%, and 78% in 2008 (Informe COTEC, 2014). In summary, the available comparative data shows that the economic weight of Spain on the whole EU-28 and OECD does not correspond to the weight in its R&D spending. This distance is much higher comparing the weight of the Spanish R&D results, whether measured by patents or by high-tech exports.

Even though the important progress experienced by Spain in the last decades, the country is only a “moderate innovator” according to the Innovation Union Scoreboard (IUS), which measures the performance of EU national innovation systems (European Commission 2014). A number of new Member States, which have a much shorter tradition in knowledge-based activities, have succeeded in reach and passing Spain.

**Graphic 2. Spain's Aggregated Innovation Performance-
Innovation Union Scoreboard Index**



Source: *European Commission (2014a)*

The average performance is measured using a composite indicator building on data for 25 different indicators with data from 2007 to 2013, going from a lowest possible performance of 0 to a maximum possible performance of 1. Average performance reflects performance in 2012 due to a lag in EC data availability (European Commission, 2014).

Considering that the number of European patents request is a reliable indicator of the R&D work conducted in a country, when we look at the number of European patents requests per million of inhabitants, Spain obtained a rate of 27, being only higher than Czech Republic, Hungary and Portugal (countries with a per capita GDP 30% lower than the Spanish one) (Foros del PI, 2009). The gap with the leader, Switzerland (with a per capita GDP 35% higher than the Spanish one in 2009), scoring 762 European patents requests per million population, is of serious concern.

The results of R&D, measured by the number of triadic patents –those granted with common effects at the European, American and Japanese patent office's– recorded in 2012 by companies or research centres in Spain, were 1.19% of those registered in the EU-28 and 0.34% of the OECD. These percentages are much lower than in 2010 (1.72% and 0.50%, respectively), and those that would correspond to the economic weight of Spain in these two groups of countries, and even also to the Spanish weight of their R&D expenditure (Informe COTEC, 2014). Indeed, within the EU, Germany, France and the United Kingdom gathered together 19.6% of world triadic patents in 2011. The patents obtained by Spain in 2011 represented 0.33% of the world total, a very low percentage of the Spanish weight economy in the world.

In addition, comparing Spain with a similar economy in terms of size, structure and per capita GDP like Italy, the latter obtains 66 patents per million of inhabitants, a figure 2,5 higher than the Spanish one. This comparison becomes even more dramatic if we look at the figures of European Patents obtained, being Switzerland the leader (287), Italy (34) and Spain with 7 only beating Czech Republic (4), Hungary (4) and Portugal (2) (Foros del PI, 2009). It has to be noted that, where Italy success rate is of 51%, similar to the rates achieved by Germany, Sweden and France, Spain is only scoring a poor 28% success rate. Moreover, if we measure the triadic patents obtained according to the population of each country in latest years, in 2011 Spain occupied the 26th position among countries, with 3.0 patents per million populations, losing a job compared to 2010. This figure is 3.6 lower than that achieved in 2000 and remains below the average for the EU-28 (23.3), OECD (33.1), or other European countries like Germany (61.5) and Sweden (70.7), (Informe COTEC, 2014).

According to the last progress report from an expert panel at the European Research Area, R&D&I are essential to Spain's success and future progress, and it has to be of crucial importance for its economic policy. An increase in public R&D&I resources is needed, but this should be founded on a strategic framework which maps spending over some year's period with a broad governmental agreement. Further, one of the priorities of the Spanish National Strategy is reinforce internationalization (European Commission, 2014). In particular, "Support for the internationalisation and promotion of the international leadership of the Spanish Science, Technology and Innovation System". The National Strategy, mainly implemented by the Ministry of

Economy, Industry and Competitiveness, refers specifically to the promotion of international mobility in the researcher career, but it also may refer to achieve larger international funding. Indeed, several current structures support Spanish researchers to prepare projects to be submitted to funding to international sources, such as the EU Framework Programme. Even more, according to EU experts, criteria with regard to internationalisation performance should be introduced in project and institutional funding mechanisms, and in researchers' careers, like rewards to researchers engaged in EU projects.

Spain is a country performing below international expectations in terms of R&D, Innovation and Intellectual Property outcomes, and as such, the results obtained from this study could explain the current Spanish inconsistency, and also extrapolated to countries that may show poor similar outcomes. Consequently any weak points we may identify in the R&D system and the recommendations we may suggest, shall be beneficial for other countries showing the same weakness, thus conferring validity to the selection of Spain under study for this research work.

Chapter 3

Analysis of internal factors

3.1. THE CEO AND TOP MANAGEMENT TEAM SUPPORT FOR R&D AND RESEARCH MANAGEMENT TEAMS

Theory suggesting that resources influence firm performance is largely supported empirically. Value, rarity, inimitability, and non-substitutability are the commonly cited characteristics that provide the core logic linking resources to competitive advantage (Barney, 1991; Sirmon, Hitt, Ireland and Gilbert, 2011). Based on many years of empirical work, results demonstrated the significance of these resource features for firm performance. Besides this, empirical results end that what a firm does with its resources is as important as its own resources, since only resources does not guarantee the progress of competitive advantage. Instead, resources must be accumulated, bundled, and leveraged, meaning that the full value of resources for creating competitive advantages is achieved only when resources are successfully managed.

Resource management has been defined as the complete process of structuring, bundling, and leveraging the firm's resources with the aim of creating value for clients and competitive advantages for the entities (Sirmon et al. 2011). It includes structuring the range of resources, bundling resources to build capabilities, and leveraging capabilities outside the firm to create value. Empirical studies probed that the synchronization of these processes is something very important to create value.

Managers differ in their resource management abilities, and these differences matter to firm results; the resource management effect is contingent upon the quality of the focal resources; and synchronization across processes is vital for competitive advantage (Sirmon et al. 2011). The complementarities of these frameworks suggest that integrating them will make easy research of managers' actions within capability and resource-based logics. To hold up this integration, literature has studied both resource management and asset orchestration, focusing on the way managers contribute to create a resource-based competitive advantage. In fact, multiple levels of managers coexist, with each level contributing to achieve competitive advantage. Managers at different levels dynamically work together to influence many firm outcomes like innovation, strategy development, learning, and performance. The *orchestration of resources* may require the input from each managerial stage in the entity's hierarchy (Sirmon et al. 2011). The way resources are managed for different strategies, at different levels in the management hierarchy, like CEO & TMT and Head of Departments, may do influence competitive advantage and the firm outcomes.

When analysing research and development emerging fields, it has been seen that the survival of new scientific fields significantly depends on the ability to incessantly mobilize resources and support too, (Clausen, Fagerbergb and Gulbrandsenb, 2012). Further, for new R&D emerging fields, attracting basic funding in the long term has been seen indispensable for research unit's ability to maintain cognitive control of its research programme. Support may be obtained from the organization –often a R&D centre or university– where the effort takes place, or from sources outside the organization such as research councils, governmental departments, and foundations. Support from different sources –with different motives and strings attached– may influence the character of the organization in different manners and, in that way, also the scenario for the unit's long term survival. However, high motivation and entrepreneurial spirit may not be enough. The proponents of a new proposal within the entity also need to mobilize support not least financial, if the unit is to survive and do well. For these units, support from the leadership of the centre (CEO/TMT) may be of crucial importance. Following this argument, literature has shown that it is therefore worthwhile in the early phase to mobilize financial support from several sources, including external ones, because this reduces the potential for destructive conflicts over resources (Clausen et al. 2012). In the long term, such support from different sources needs be converted into more stable funding that may provide sufficient space for the progress of the "scientific/ intellectual movement".

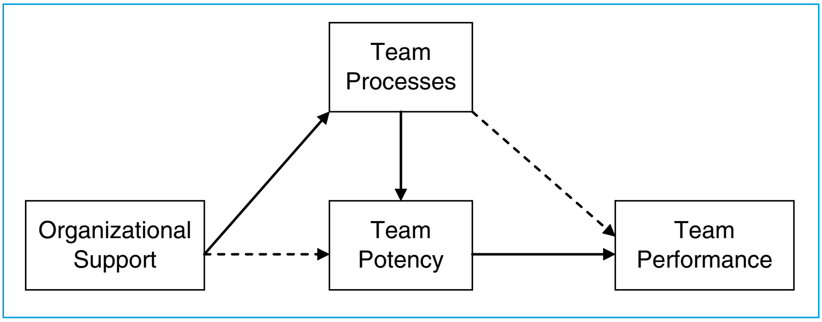
Literature has probed a positive relationship between organizational support and potency, mediated by effective team processes (Kennedy et al. 2009). This implies that team processes have been observed associated with team performance, and the effect of team processes on team performance seems mediated through potency.

Since teams are often more efficient and effective than individual work, and teams are significant investments for organizations, understanding which factors are associated with team effectiveness is important, so that organizations can aim their investments to maximize performance. According to (Kennedy et al. 2009), there is also positive relationship between team processes and managers' ratings of team performance, also mediated by potency. Thus, understanding how organizational support affects potency is a basic issue, being potency strongly associated with team performance.

In addition, team members' perceptions of the organizational support they receive also affect potency, through their effect on team processes, and team processes influence team performance through their effect on potency (Kennedy et al. 2009). Potency is an important construct in work teams literature because it has resulted tough associated with team outcomes. Previous studies have found that potency has stronger influences on team effectiveness than do many other variables. Further, team members' perceptions of various external and internal factors to the team may affect potency, which affects the team effectiveness.

Internal factors to work teams include group characteristics (team goals, etc.) and the characteristics of team members (abilities, experience, etc.). External factors include characteristics of the context in which the group is set, such as resources, rewards, and leadership. Potency mediates the influence of these factors to the work team on team effectiveness (Kennedy et al. 2009).

Figure 3. Mediating Effects of Team Processes and Team Potency on Team Performance



Source: ***Kennedy et al.*** *(2009)*

If team members perceive that they have enough resources and that the team has the required external support, then the individuals are expected to believe that the team can achieve its objectives –that the team can succeed–, and they will put forward more effort and persevere longer to their goals (Kennedy et al. 2009). Thus, it is the perceptions of team members what directly affects potency. In fact, insufficient support systems are often seen responsible when teams failure in achieving their objectives. Understanding how organizational support affects potency is also important because managers (Director or TMT in R&D institutions) are able to influence the organizational support context in which the research teams work. Instead, it is difficult for Directors or TMT to change team members' characteristics which affect potency without replacing them, something that it is not practical or possible in these organizations (Kennedy et al. 2009). For this reason, it is better for R&D entities to support teams by making sure they have the necessary resources for developing a good research work (access to information, equipment, facilities, time to meet, etc.). Organizational support systems that provide structure and leadership to groups are likely to ease more efficient and effective communication and decision making within the work teams, improving the global final performance.

Some organizational support systems already studied in literature are the following: (Kennedy et al. 2009)

Group design: R&D centres can support their teams by giving them a clear function, access to appropriate resources, and the right they need to accomplish their purpose, plus providing them with suitable membership.

Integration: R&D centres can provide communication channels for teams to interact effectively with other groups, from inside and outside the organization, which they shall interact to accomplish their work.

Information: Work teams need information about their areas goals and priorities, in order to know organizational concerns and issues that influence the team's work. Understanding the general framework facilitates teams to preserve focus on their objectives and to prioritize their research works aligned with the larger business unit. Teams also need to know about the results of their work, so that they can make the necessary adjustments to improve their outcomes.

Management support: Directors and TMT, managers and teams supervisors can provide guideline to help their teams to better organize their work, and can offer encouraging leadership. Managers, who give freedom to their teams for them to develop their work tasks, take their ideas into consideration, and put into practice their recommendations in an opportune way, also show support for the teams.

Measurement of performance: Effectual results-measurement systems are needed within R&D organizations to give teams appropriate goals, so that members can know what is expected from them, how they will fit globally into the R&D centre, and how they shall interact with other members to best accomplish their work. This measurement helps teams to stay on the path to get their works well done, and makes members feel more ownership of their work and self-confident. Follow a clear direction and to have specific and measurable objectives aligned with the organization goals, allow teams to role more autonomously and to be more effective.

Teamwork training: Providing training to improve the specific skills that members' teams need to work effectively within their groups is another way of teams' organizational support. Teamwork training to develop skills helps team members to build up shared mental models of teamwork which permit them to use analogous information, to better coordinate among themselves and to facilitate conformity about proper teamwork behaviours.

Rewards and recognition: Reward systems are crucial because they motivate team members' efforts, strengthen appropriate behaviours and good performance, and also transmit priorities within the group, so that teams develop crucial tasks.

In any organization, rewards play an important role in building and maintaining the commitment among employees that ensures a high standard of performance and workforce stability (Malhotra, Budhwar and Prowse, 2007). Employees offer or enhance their commitment when organizations meet employees' expectations regarding fulfilment of their needs. Thus, organizational commitment has also been studied as a function of work rewards and work values, and suggests the importance of work rewards for continuously motivating employees. Following this argument, it is important for management to understand and discover the antecedents that develop each component of commitment (Malhotra et al. 2007). Literature clearly shows that intrinsic rewards emerged as more powerful indicators of affective and normative commitment than extrinsic rewards, thereby stressing the importance of job redesign in different organizations including R&D centres.

As competition for research funding increases, research organizations are looking for policies to maximize their competitiveness. Research organizations increase their prestige when their researchers win grants, and this, attracts public attention and other financial rewards (Derrick and Bryant, 2013). Accordingly, a number of organizational policies have been designed to increase the performance of their research staff and support them to engage in projects that are viewed favourably by grant committees, thus increasing the prestige of the institute and the potential for further philanthropy. In fact, in a culture that was described by researchers as becoming increasingly competitive, research organizations compete against one another for an increased share of public funding. From the organizational point of view, researchers who attract more competitive public grants raise the scientific prestige of the institution, and this also attracts higher levels of funding, allowing the centre to put forward further incentives to researchers and support more research programmes (Derrick and Bryant, 2013). Thus, providing incentives remains an important tool for research organizations to realize business objectives.

Several organizations offer incentive schemes for researchers as part of their policies and recent literature has studied how existing and new policies at the organizational level support and encourage high-quality research while balancing the expectations of researchers (Derrick and Bryant, 2013). Researchers' motivations may be aligned with the motivations of the incentive schemes. Therefore, the existing incentive schemes are crowding in these motivations by reinforcing current behaviours and perceptions. When the success of existing incentives does not change research performance but reinforces existing cultural norms of behaviour, incentives, instead, may act as rewards. This way, incentives can also be used by organizations to attract good researchers, a greater share of research funds, and further indirect and alternative modes of funding.

Extrinsic job characteristics are factors that offer the external context in which job responsibilities are performed, such as wages, benefits and supervision. In contrast to extrinsic job qualities, intrinsic job qualities are embedded in the *nature of work* required by the job, such as the meaningfulness of the work to an individual or autonomy at work (Craft Morgan, Dill and Kalleberg, 2013). Researchers have found that higher salary and opportunities for progression are linked with the intention to stay with an employer. Indeed, both intrinsic and extrinsic characteristics are major predictors of job satisfaction, since different characteristics are in charge for job satisfaction and dissatisfaction. Job satisfaction is determined by the nature of the work (i.e. intrinsic rewards), while job dissatisfaction is mainly produced by the external work environment (i.e. extrinsic rewards).

Intrinsic rewards are a critical element in employee retention, satisfaction with the organization, and career success (Tymon, Stumpf and Doh, 2010). Multinational, international, and national managers may have non-monetary ways to promote retention and employee satisfaction, even in challenging labour market environments, and particularly in economic crisis times, like the latest ones. Moreover, the importance of intrinsic rewards as they relay to employee satisfaction, career success, and intention to leave, and the noteworthy role of attitudes to the firm's reputation and societal status, underline the weight of non-pecuniary elements to workplace management success (Tymon et al. 2010). Intrinsic rewards may contribute to both the quality of an employee's work life as well as organizational success. Intrinsic rewards also related to satisfaction with the centre and the awareness of career success. Through its impact on satisfaction with the firm, intrinsic rewards may promote job maintenance.

According to Hausknecht, Rodda and Howard (2009) research works, job satisfaction, extrinsic rewards, attachments, organizational commitment, and organizational prestige are the most commonly reasons for staying. Organizations that fail to retain high performers will be left with short-staffed, less qualified labour force that in the end will decrease their capability to remain competitive. Thus, management programmes should be designed to those teams who are most responsible for the entity's success. Since high performers are most likely to possess the knowledge, skills, and experience necessary to give to the global success of the centre, job performance may be the main indicator of employee value. In fact, the ones interested in analysing and promote employee maintenance should consider how alternative retention management strategies will influence different employee groups (Hausknecht et al. 2009).

In organizations like Knowledge transfer entities, intrinsic rewards have been seen powerful tools to overcome barriers (Martínez-Pérez, Martín-Cruz and Estrada-Vaquero, 2012). Specifically, intrinsic rewards enable the development of informal groups outside formal organizational structures, which allows rapid problem solving, the transfer of improved practices, and the creation of professional abilities. Furthermore, intrinsic rewards promote a work environment that expedites both formal and informal communication, which entails stronger organizational learning behaviours. Intrinsic rewards also may increase employees' commitment to the organization by creating self-improvement desires as a means to support the organization, bringing about the development of learning capabilities (Martínez-Pérez et al. 2012). Thus, intrinsic rewards contribute and promote employee participation, and are a natural by-product generated by the process itself within this type of firms, which may also develop R&D activities.

Extrinsic rewards also stimulate employees to perform valuable tasks for the organization (Martínez-Pérez et al. 2012). Employees who feel satisfactorily rewarded will develop a stronger commitment to the organization and will remain for extended periods of time. Moreover, intrinsic and extrinsic rewards are important to increase employees' willingness to share their knowledge with other workmates. Being relevant both types of rewards, literature has proved that intrinsic rewards have a significantly greater influence on employees knowledge transfer, thus contributing to the fulfilment of the organizational mission to a higher extent.

Attending to innovation firms' performance, the success of these organizations has been described in literature to depend more on their intelligence capability –such as employee creativity– than in more traditional material assets (Zhou, Zhang, and Montoro-Sánchez, 2011). The creative capability of individual and collective knowledge personnel is the energy that boots innovation within centres. While creativity leads to the production of new and useful ideas in any area, innovation is the successful execution of those creative ideas within an organization. Thus, in highly dynamic business environments, innovation and creativity are decisive for creating competitive advantages for the firm. People are the most fundamental resource of an innovative organization, and all innovation-based firms have to study how to manage, motivate and reward their groups to be able to success.

Besides this, reward management is a key function in Human Resource Management systems in modern entities, playing an important role in attracting, retaining and motivating employees (Zhou et al. 2011). Thus, the inappropriate application of reward practices is principally responsible for impeding innovation and progress within organizations. The recent focus on a "total rewards" framework combines both intrinsic motivations and extrinsic rewards to achieve a balance in reward management. This model not only includes monetary rewards and security benefits, but also emphasizes intrinsic motivations such as performance recognition, work-life balance, and employee career development, between others. Additionally, the newest work on reward systems also emphasizes the optimal mix of multiple types of financial, prestige and job content rewards for increase employee responsibilities and contributions.

Literature has also compared beliefs held by members of different demographic groups in R&D organizations regarding the degree to which different types of rewards may produce organizational benefits. Results found that intrinsic rewards and salary increases were widely believed to provide benefits to an organization (Chen, Ford and Farris, 1999). Further, researchers have re-examined the capacity of reward systems to adapt the preferences of diverse R&D professionals and align their efforts with the entity's strategic priorities within high technology organizations. According to R&D members, intrinsic rewards were the most beneficial, and the individual variable rewards the least beneficial to the organization (Chen et al. 1999). The highly positive evaluation of fixed (salary) rewards supported the more traditional argument that monetary rewards work too.

When R&D centres facilitates organizational support among work teams, team members tend to perform better. But the organization just offer team members resources and motivation to improve their processes, which gives teams the confidence to think they can be effective and perform higher (Kennedy et al. 2009). Team processes refer to behaviour and interactions among group members, like communication, cooperation, and decision making processes, etc. within the group. Organizational support, such as access to information, feedback, and resources, may help teams to carry out work efficiently and to fast identify and find solutions to possible problems.

Given de above, the R&D centre Director (CEO) and the Heads of the research units and Heads of the management departments (TMT), can give support to the different work teams by putting in practice the already reviewed support systems, in order to get better performance in competitive fund acquisition by sponsored international projects. This support from the managerial team is necessary since it may influence the design and composition of the R&D and management work groups within the centre, and how they integrate with other work teams (inside and outside the centre).

The rewards policy may be an important decision of the managerial teams, which may impact in members' motivation and their commitment with the institution, in their daily work and in the wiliness of obtaining resources by international competitive funded projects. The CEO can also decide the available resources for career training in work groups, and he/she is the last responsible of the information reaching team members, like the information really transferred to R&D groups from the management office staff in regards to funding opportunities and international/national calls for proposals. In summary, the CEO and TMT support for R&D and for research management activities will also determine the performance or success of R&D groups in getting competitive funded projects and, as positive or negative moderator of this relation, will be a key variable to study and clearly consider in the incoming research work.

3.2. RESEARCH MANAGEMENT SERVICES

Science and technology are considered some of the most important drivers for a country to improve and strengthen its national economy and overall competitiveness, and their influences on national economies have been increased during the last years (Choi, Lee, and Sohn, 2009). Thus, many countries have made an effort to raise their levels of science and technology with research and development projects, promoting different funding programmes for these types of projects. Moreover, higher attention has been paid to government R&D funding programmes, and different studies have been conducted to evaluate the performance of R&D projects, making a diversity of attempts for effective performance assessment. In this sense, the results of government R&D funding programmes have been analysed to enhance performance of institutions conducting R&D activities granted by the government. In addition, the combination of legal and financial systems and corporate control mechanisms, known in literature as corporate governance, also affect the development of R&D projects (Hillier, Pindado, de Queiroz and de la Torre, 2011). Studies have found that measures like effective investor protection, a bank-based financial system, and strong corporate control mechanisms conduct to impact of corporate governance on R&D greater disclosure and accountability, facilitating the availability of external financing for R&D in firms and R&D entities. This is an important issue for government national agencies, since through corporate governance, they can promote R&D investment and, as a consequence, economic growth and improved social welfare.

Over the last years, there has been an increased academic interest in technology transfer too, since public research institutes have faced high pressure to commercialize their research through licensing technology and the creation of science-based entrepreneurial firms (SBEF) (Knockaert, Ucbasaran, Wright and Clarysse, 2010). This growing emphasis on the generation of commercial outcomes from university-based research and public R&D centres has also been supported at national policy level, since the commercialization of university research results is viewed as a key driver of national competitiveness and a potent source of innovation. Different initiatives seeking to promote the links between universities/R&D centres and industry partners have consequently been created. Indeed, many research centres and universities have taken great efforts in pushing commercial agendas to generate more financial value from their research, by founding new structures aimed to commercialize their scientific discoveries and encouraging entrepreneurial activities, like the establishment of the TTOs (Ambos, Mäkelä, Birkinshaw and D'Este, 2008).

In some of the most current developed economies, like Germany or Sweden, there has been a heavy investment in infrastructure for technology transfer at universities and public research centres, although European countries may have different legal regimes with regard to the property rights in research results (Sellenthin, 2009). The dedicated technology transfer structures may have varied resources, capabilities and experiences, depending on the organizations where have been established, and may be complemented by the incorporation of supportive policies, activities and incentives designed to legitimize commercial and project management activities.

3.2.1. The Transfer of Technology Offices (TTOs)

To understand the situation of the current research management services within R&D Spanish institutions, it has to be highlighted that their appearance is relatively recent (Red OTRI, 2016). It is from the Science Law, in 1986, when Spanish universities and R&D centres started to create supporting structures involved in research management, with different functions and organizational/functional units. This initial situation of existence of multiple research management models still remains in our days (MINECO, 2016).

i. Historical Retrospective

The Spanish National Plan for Research and Development (1988-1991) attempted the full integration of R&D in the economic system, building the Science-Technology-Industry system. This system tried to optimize the profitability of public research centres R&D activities and to create interface organizations, which may favour the relations between the components of this system. This political willingness, initially found support from part of the research community, and also found the companies concern. The TTOs are within these entities (Offices of Transfer of Research Results), and were included in the organizational structure of the National Plan Secretariat, forming the "OTRI" Network, officially supported from the Public Administration by the

Office of Technology Transfer (MINECO, 2016). Thus, the TTOs were born in late 1988, under the National Plan for R&D structure, with the objective to promote and facilitate cooperation in R&D between public institutions researchers and private companies, both national and European (Red OTRI, 2016). Some years later, by the Order of February 16, 1996, (published in the B.O.E. of February 23), the TTOs were given official status with the creation of an Official TTO Register, which depends on the Spanish *Comisión Interministerial* of Science and Technology.

In a first stage, universities, public research organizations and some technology centres were part of the OTRI network. In 1996 the network was expanded with the incorporation of other interface units, like the University-Enterprise Foundations, certain business associations and the Centres of Innovation and Technology. According to the latest data available of October 1st 2015, there are 239 registered OTRIS in the Spanish *Comisión Interministerial* of Science and Technology, most of them at universities (TTO Directory - MINECO, 2016).

ii. TTOs Main Functions

During the development of a research project, intermediates products are generated which may be used to measure the degree of the project real progress. Once the project is finished, it may generate final products, which may provide added value to the project, and may even have a market price.

The TTOs are interface units in the science-technology-company system, and their main mission is to boost the relations between actors within this system, constituting one of the mechanisms for achieving a key objective in scientific research and technological development: To transfer to the market scientific results rose from R&D activities (MINECO, 2016). To do this, the TTOs are involved in identifying the technological needs of socio-economic sectors, and in promoting technology transfer between public and private sectors, thereby contributing to the implementation and commercialization of the R&D generated results within universities, public research centres and other technological institutions.

The OTTs also help researchers to protect inventions and intellectual properties through patents, copyrights, etc., namely to protect the applied research results with potential value (Red OTRI, 2016). This process ensures the transfer and protection of valuable research results in R&D centres, advising researchers groups about patenting and about their rights and duties in this matter. TTOs also facilitate and manage the transfer of scientific-technical research results, contracting and performing all acts and efforts on behalf of researchers.

The TTOs manage all technical aspects related to their mission, such as negotiating and drafting contracts, preparing patent applications, development of European projects in its formal aspects, management and dissemination of the technology available in their respective institutions (commercial portfolio), direct contact with companies, etc. According to Cassiman, Di Guardob and Valentini (2010), basic research projects are likely to be developed through formal cooperative agreements with universities and research centres, and for strategically more important projects, in particular those where the knowledge to be developed is predominantly new to the firm and market (early in the project), it is more likely to choose formal contracting with the research institution, in order the company to assure full organizational control of a strategically significant project for them and the potential transfer of technology. Within the context of the innovation process, scientific institutions have also acquired a prominent role as research partners, since companies tend to engage in linkages with scientific institutions. Thus, among a wide diversity of activities, the TTOs also manage the different drivers of the alternative formal agreements that might engage scientific institutions and universities with firms: cooperation agreements and contracting.

TTOs Specific objectives (MINECO, 2016):

- Encourage the participation of the scientific community in R&D projects.
- Develop the database of knowledge, infrastructure and supply of R&D in their respective research centres.
- Identify the results generated by the different research categories, evaluate and disseminate its potential transfer among firms, directly or in collaboration with other interface offices.
- Facilitate the transfer of these results to private companies.

- Collaborate and participate in the negotiation of research contracts, technical assistance, consulting, patent licensing, etc., among their R&D groups and firms.
- Manage contracts with the support of the entity's administrative services.
- Report about the different R&D programmes, and facilitate the development of technical projects and their management.

TTOs most common functions (MINECO, 2016):

- Actions addressed to business companies: Disseminate the institution catalogue of available capabilities to companies.
  Advice companies on the most appropriate skills according to their business demands.
- Actions aimed at the research centre and university:
  Report about R&D programmes, regional, national and European.
  Facilitate project development and project technical processing.
  Entrepreneurship programmes (spin-off creation).
  Programmes of horizontal mobility for researchers towards business companies.
- Actions aimed at both:
  Administrative support for contracts establishment.
  Search of funding sources.
  Patent management.
- General interest actions:
  Build the knowledge database, infrastructure and R&D supply for the Centre.
  Periodic reports of R&D results.

Insights relating knowledge transfer, TMT composition, and SBEF performance have been studied, together with the implications for TTOs (Knockaert et al. 2010). An important role for the TTO will lie in the stimulation of researchers to commercialize their technology and the creation of awareness of entrepreneurship between project managers as a potential career move within research communities. Nevertheless, there is an important challenge in developing those activities, since the necessary change implies taking an institution that is prepared and used to do academic research and to ask its members to develop the capacity of doing commercialization of their technologies and ideas (Ambos et al. 2008). The R&D centres and universities may ask their fellows and scholars to build coordinated competence for two activities: research/academic and commercialization/transfer of technology. Thus, tensions happen at the level of the whole organization trying to cope with these sets of activities at the same time, and also at individual level, which may have to solve how to balance his or her time between competing demands (Ambos et al. 2008). Further, literature has shown that the tension between academic and commercial demands is more significant at the individual level of the researcher than at the level of the organization. This way, universities and R&D centres have confirmed being able to manage the tensions risen between academic and commercial demands through the creation of dual structures, like research areas or departments and Research Management Offices. Following this argument, we could assume that tension may also arise when researches have to apply for competitive funded projects, since they have to face additional activities not much related with their daily scope of research duties, and are also bounded to deal with project managers.

3.2.2. The TTOs within the Research Management Services

Research management is the discipline responsible for organizing and managing R&D resources, so that all the required work of a research project can be achieved with its scope, time, and with the determined costs. Research management seeks to add value to the research activity of staff (Kirkland, 2005), without being part of the research activity itself. In this context, a project is defined as a temporary endeavour, unique and progressive, undertaken to create a product or service also unique.

To have a well-trained, fully staffed, and adequate management office of sponsored programmes has a great value for research institutions (Roumel, 1994), since the establishment of a management research office can be a dynamic, beneficial addition to the infrastructures of the R&D centre. Nevertheless, the implementation of a R&D management system developed by a specific department is a mark of excellence for research centres and a precondition of effectiveness externally (Kirkland, 2005), that allows them to better define, document and manage all R&D activities in an effective and uniform way, thus preventing to loose activities likely to being subsidized by external funds.

Research management services, which promote and manage external income, imply planning, organization, monitoring and control of all aspects of R&D projects in an on-going process to achieve their goals (Kirkland, 2005). This includes the provision of administrative and bureaucratic support for researchers at all stages of research, getting the proper degree of confluence between the various standards (principle of legality) and the specific needs of research management (principle of effectiveness).

They provide a series of benefits:

- Provide guidelines for effectively organizing and managing R&D activities.
- Optimal resources management.
- Analysis of internal/external technological status.
- Planning and monitoring of research objectives.
- Appropriate management of projects portfolio.
- Demonstrate that the organization invests in R&D and it is well managed.

i. Phases of Research Management in R&D Centres

A project is “a temporary endeavour undertake to create a unique product, service, or result” (PMI, 2013), and in R&D institutions research activities are organised in projects and teams (Jordan, Hage, Mote and Hepler, 2005). In those R&D entities with settled Research Management Services, a centralised operating model for R&D management may be proposed in order to deal and control the overall stages and progress of the developed projects. The purpose of this centralized approach is the researchers addresses a unique Unit or Department to clarify, consult, and handle all issues related with R&D activities. To see in detail the advantages of this centralized model, its implications, the potential obstacles, and also the solutions that may arise to avoid or mitigate them where possible, we have to pay attention to three stages of research management: pre (of request), implementation phase (project implementation) and phase of results (accountability, scientific production, patents, etc.). Also, reference should be made to the environment that somehow affects the entire management process should be taken into account, like the general legislation, the self-regulation of the competitive funding calls and the internal rules of each institution.

Pre - award phase

This phase includes all activities taking place up to the beginning of a research Project (Kirkland, 2005). At this stage the funding agencies publish their calls for proposals. The research management service tasks will focus on the dissemination of announcements, information requirements, calls formal conditions, deadlines, etc. providing personal advice to research groups according to their potential needs (Universidad de León, 2001). Check and feedback of proposals is also made, and it will cope with all the required documentation and send it to the different funding agencies, following the reception and acceptance process. Thus, this phase of research management involves those functions aimed to boots and facilitate researchers their participation in competitive calls, and implies in-depth knowledge of the different calls and funding programmes.

Post - award: Implementation

Post-award activity might involve assistance to researchers in project management and administrative functions such as financial reporting (Kirkland, 2005). This phase begins with the concession of the award, or with the signature of the research agreement (Universidad de León, 2001). In this phase the researcher is informed about the conditions of the project awarded (start date, admission costs, possible amendments, end date, explanations and reports, etc.). Advice on the handling of expenses, in accordance with established procedures, is also provided. The execution of progress reports and final project report is also issued.

The research management service must have the adequate knowledge of each competitive call, and fluent contact with the different funding agencies for consultation and clarification. It shall have an adequate and updated knowledge of the different legal regulations, and to use flexible procedures of different norms, to get a quickly and efficiently management, since researchers need solutions to their problems implementation. Flexibility and agility in the proceedings is crucial.

Post - award: Results and transfer of technology

Once the project is finished, the research management service tasks will focus on the justifications to the funding agencies: justifications of research activities for audits and financial controls, databases development, support in scientific production evaluation, etc. (Universidad de León, 2001). In this phase, the control, the monitoring and all documentation procedure of results is done, and it also undertakes externally facing activities such as the commercialization of intellectual property and the dissemination of research results to the wider community (Kirkland, 2005). This phase relates to general institutional policy issues that directly impact on the R&D institution research capacity, but the developed activities are not confined to research.

Considering the above, research management offices aim to help researchers by simplifying research project management and agreements, while establishing a systematic information system to enable researchers to better understand the opportunities, calls, demands of business, etc. in order to enhance their options with higher and new resources. This way, research management services include support, counselling, management and delivery of services necessary for the fulfilment of the centre R&D objectives. These functions must be performed under the principles of legality, effectiveness and efficiency, allowing researcher to carry out their research activities more easily and quickly, and to safely face potential problems and challenges.

ii. Main Function of Research Management Offices in R&D Centres

- Manage services and R&D projects portfolio in all phases.
- Carry out the measurement, analysis and performance improvement of results.
- Technology transfer management and the protection and exploitation of results.

Researchers are entitled to have the information, advice and administrative support within their institutions to apply for sponsored research projects and carry out research in a proper way. The research management office will provide researchers with specific support to guarantee research efficient development (Blankinship, 1994). It provides information services and advice to researchers, reducing the potential stress emerged during the pre-award phase, facilitating their access to collaborative networks, and technical and administrative project management coming from different sources of funding, both domestic and international.

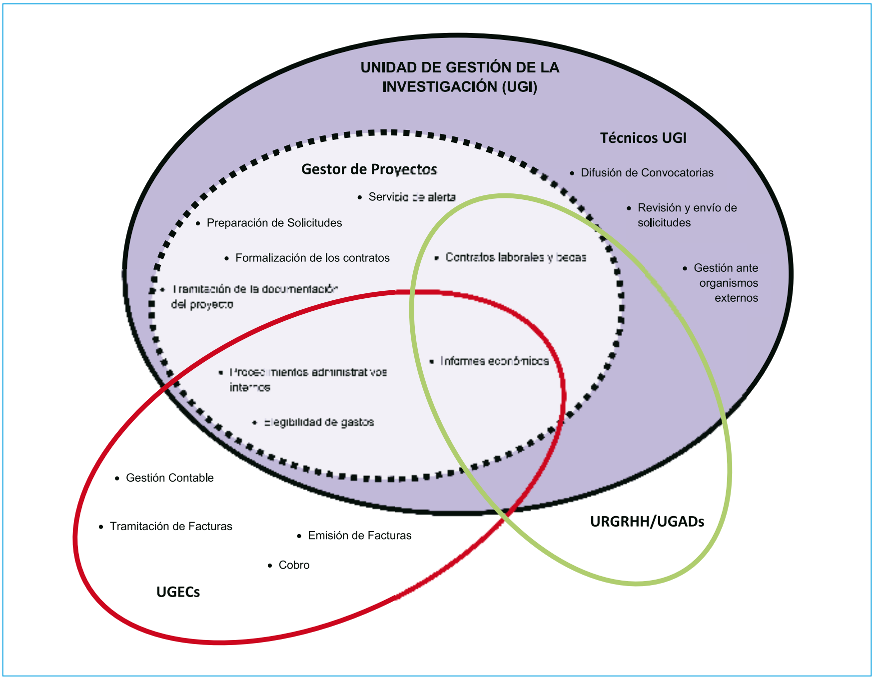
Research management offices offer technical and administrative support to research groups (RUVID, 2016; FISABIO, 2016):

- Search and processing of available information regarding subsidies and competitive grants for research projects within existing funding programmes.
- Search for potential partners of interest, both national and European, using internationally available sources of information.
- Advice and checking when submitting research projects to competitive calls for proposals.
- Administrative and technical support in project proposal preparation: technical assistance in the proposal formulation and fulfilment.
- Management of agreements and contracts in collaborative and research projects.
- Tracking the various projects stages.
- Managing databases about projects, researchers and R&D groups.
- R&D evaluation and management performance of results.
- Conducting seminars or training activities for researchers and technical staff to provide them with useful information about research funding programmes.

Nevertheless, it has been seen that research management offices include planning, organizing, monitoring and control of all aspects of the project in an on-going process to achieve their goals. To accomplish these objectives, research management officers may perform diverse services for both internal staff (researchers) and external customers (firms and other institutions) (Red OTRI; 2016). In some R&D centres, these services may also include the activities and management services mentioned for TTOs:

- Advice and contractual relationship with companies: Patenting and commercialization.
- Analysis and markets research, companies and products that may imply potential alliances with the entity, either for partnership or for research and technological development partnerships.
- External entities support in the knowledge and resources to finance innovation activities.
- Support and advice about collaborating companies R&D management activities.

Figure 4. Functions of Research Management Departments



Source: *Adapted from UCLM (2012)*

3.2.3. *Professional Characteristics of Research Managers and Administrators*

It has been highlighted that research management covers a wide range of roles, and these are commonly spread between academic and administrative staff within institutions. Structures and organization of research management differ markedly between centres, but all need a good articulation and coordination between the academic and administrative sides (Connell, 2004).

The work of the research management office staff is heavily loaded with technical issues and also has an important part of relationships. Skills such as connection and communication, or the ability to work as a team are essential. In fact, clear communication between researchers and research managers fosters partnership between them and can minimize problem in proposal submission and post-award process (McCallister and Miller, 1993). This relationship can be a key variable in the success of the institution research efforts.

People work in research management offices may be results-oriented, with self-initiative and teamwork ability, with ability to organize, control and monitoring activities, planning capacity and ability to communicate (Red OTRI, 2016). They also may have capacity for synthesis and control of numerical figures, organizational awareness and public relations skills. They use to be proactive persons, flexible, with teamwork capability and negotiation skills (RUVID, 2016). Research managers need good negotiating skills with counterparts in other entities.

Both legal and accounting skills are increasingly widely needed. Legal skills required relate to interpretation of the law with respect to project applications and contracts into which the centre is entering and coordination with national (RUVID, 2016). Accounting skills are required in research offices because many contracts include complicated procedures, involving large amounts of money.

Good administrative skills are required for coordination of related activities at central level –research office/TTO/Europe office/etc–. A good communication with the centre's public is an important skill too: to inform the public about research under way, to maintain public trust through openness in times of crisis, to engage public interest in research as a field of activity, and the research achievements of the institution. It is also important the ability to help researchers into a new mind-set, where it is incumbent on researchers to take the responsibility themselves for seeking funds and being willing to actively compete for funds (Connell, 2004).

Common requirements of these professionals: (Fundación Progreso y Salud, 2016; FISABIO, 2016)

- University Master Degree, with specific expertise in the research projects filed, and fluency in English language, in order to easily understand and analyse scientific and technical documents in this language.
- Knowledge and professional experience in fields like science and technology projects management, technology foresight, technology transfer and knowledge transfer, knowledge of patent systems, business development and business management.

- Knowledge of the Science-Technology-Enterprise System, as well as knowledge and experience in on-line technology information sources management, with experience in the international arena.
- Knowledge of R&D organizational structures, knowledge of the applicable normative framework, and knowledge on European, National and Regional research funding instruments and programmes.

3.2.4. Tasks and Processes of Research Management Staff

Due to the increasingly competitive global environment, public research institutions have become more proactive in the management of their research activity. Whilst the importance of robust structures is recognized, the mechanisms adopted for management units vary between institutions (Kirkland, 2005). Issues of particular concern are the extent to which professional research managers are able to forge effective relationships with academic departments and other administrative units of their centres, and the extent to which the strategy for research management is integrated into a wider institutional strategy. Research managers and administrators need to achieve a balance between facilitating research programmes and activities to their research teams, while assuring conformance with organizational and sponsored policy and procedures within their organizations (Kirby, 1992).

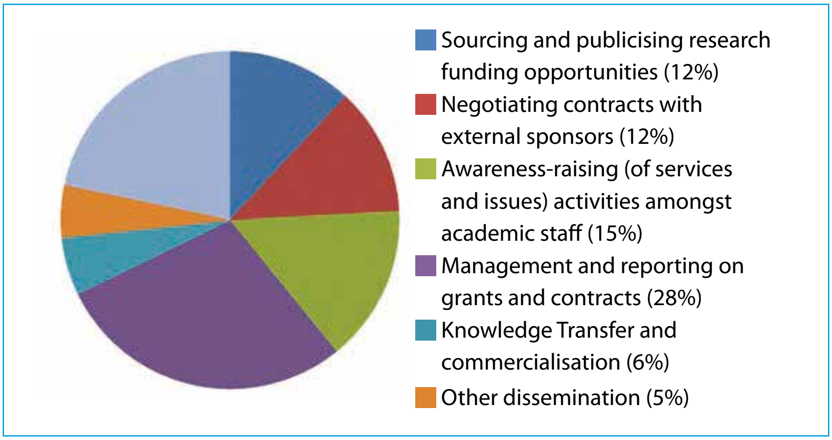
Research managers handle a huge amount of information interchange between sponsors and recipients, and the quality and productivity of their role in R&D centres is crucial when evaluating the value they add to the research process. Thus, the productivity challenge for R&D managers is to alleviate the administrative impediments that are inherent to organizational control of the research process. In fact, no process better represents productivity improvement, the link between information and deadlines, and the need for integration than the activities associated with supporting investigators research (Kirby, 1992).

Research management staff covers quite diverse fields, which requires different profiles. Activities undertaken use to include:

- Provide support to R&D project director in all activities required for the proper functioning of the project portfolio, like submission of projects to calls for proposals, follow-up, etc.

- Assistance to research groups in raising funds for R&D activities.
- Provide support in grant management for funding by different public and private institutions at European, national and regional level, from their design to the post-award phase: Proposals preparation, scientific and economic project monitoring, preparation and processing of justifications, information and support to researchers, mediation between researchers and the different entities.
- Ensure the availability of financial information to allow an appropriate level of budget implementation and the needed management information for decision-making.
- To support the recruitment, hiring and training processes of professionals.
- Preparation of reports associated with project monitoring.
- Support to coordination in scientific equipment provisions and for supplies of value material for projects, monitoring their optimization and proper use, and maintaining project infrastructure an equipment inventorying.
- Provide support in the operational management of research groups.
- Channel the specialized services of the Centre and the supporting demands arising from managed projects.

Graphic 3. Research Management Staff Activities



Source: ***PRM Report. Green and Langley (2009)***

Although the importance of project management is at the present time extensively acknowledged and the evolution and importance of project-based institutions has received some attention in theory and practice, the motivation of the individual project manager is still under-researched. According to Hölze (2010), despite the different tasks and support project managers provide to their R&D units, many of them do not feel adequately valued and rewarded for their work. They often see their role as a temporary one and use to focus more on their progression in traditional leadership career paths. In fact, human resource management has not deal much with career possibilities and career design for project managers so far. But tasks have been transferred from the traditional line organization into project-based institutions, leading to an increasing demand for qualified and motivated project managers (Huemann et al. 2007).

The role of the project manager is rather often defined by an accumulative description of tasks and organizations needs to design an incentive system for project managers considering the maximum benefit for the project managers and stimulating their motivation to stay in the project management role. We could assume a strong intrinsic motivation based on the tasks and challenges associated with work in projects, but only a very few studies deal explicitly with the specific requirements of project team members or project managers (Huemann et al. 2007), and research has shown that only the combination of incentives into an incentive system leads to overall motivation.

According to Turner's (2006) definition of a project, it is defined as a temporary organization with dedicated resources, becoming an instrument of organizational change, resource and risk management (Turner, 2006). But the role of the project manager may start from being the administrator of the project towards a much more managerial position with advanced skills and abilities. Thus, the organization may need to offer intrinsic and extrinsic incentives to foster an according behaviour. The organization also may need to create an environment where the project manager can act according to the project requirements. In addition, the project managers' career path has been observed very successful in many companies, despite organizational barriers and obstacles (Hölze, 2010).

Table 2. Example of Project Manager´s Competence Profile

			SMALL PROJECT	MEDIUM PROJECT	LARGE PROJECT
Expertise					
Breadth of experience (allrounder)	Project management methods and expertise	Knows project management methods and how to use them	•	••	•••
	Interdisciplinary thinking	Thinks interdisciplinary and judges situations from a broader perspective	•	••	•••
Depth (specialist)	Expertise	Well-known expert	•••	••	
	Creative problem-solving skills	Analyzes complicated problems fast, efficient and goal-oriented	•••	••	
Social competence					
Cooperation	Cooperation and team skills	Starts and supports interdisciplinary cooperation in the team	•	•••	•••
	Assertiveness and negotiation skills	Wins others for an idea, method or process; realizes own ideas against barriers (in the hierarchy); shows negotiation skills even in controversial situations	•	••	•••
Communication	Communication skills	Persuasive in personal contact, confident in dealing with people on different level and represents the company convincingly internally and externally	•	••	•••
	Intercultural competence	Deals confidently with other cultures		•	•••

(• =Basic skills; ••=Medium skills; •••=Advanced skills)

Source: *Hölze (2010)*

Literature has also studied the conditions for successful knowledge transfer, being project knowledge transfer a complex process always involving patterns of multiple factors (Bakker, Cambré, Korlaar and Raab, 2011). Since projects are understood as complex temporary organizational forms, successful project managers may need to handle with complexity by simultaneously care to both relational and organizational procedures.

Defining the roles and approaches of research managers and administrators professionals has already been studied (McKenzie, 1982; Pardini, 1972; Shisler, Dingerson and Eveslage, 1987). Discussions about how to improve quality and productivity in sponsored research administration and the need to examine how this profession contributes to the research process has also be treated, since the challenge to most of research entities is to improve their competitiveness for limited funds, improve quality in research activities and maximize costs effectiveness (Kirby, 1992). Despite this, little studies have been done about the influence these professionals have in the successful of competitive funds acquisition by granted projects, although they use to reach managerial positions, and they constitute a valuable support for research teams within R&D centres during all the award process.

How to manage innovativeness, complexity and uncertainty, in order to improve innovation projects effectiveness and suitable project management practice have been studied in literature (Kapsali, 2011). The research of new project management methods –with flexibility implanted in operational control and boundary activities to adjust projects to the environmental demands with limited resources– has been developed to construct new theory and practice to be applied to projects. A project manager makes decisions based on what he or she sees and understands, but sometimes, especially in large and complex projects, they are not able to view the overall project process progresses.

Literature has also researched on models to support project management planning and decision-making (Browning, 2010). In fact, analysing the arrangement between the tools of project management and their uses provides productive arguments for building extended theories of project performance. Getting the right tool for this job is essential in any situation, but in particular in the high-stakes management of large or complex projects. Further, advance understanding of technology is crucial for entities whose strategy is a key element to competitive performance –attract more partners, increase project funding, increase recognition and support from government, etc.– being the integration of competitive technical intelligence with a strategic technological foresight of trends, an integrating approach and improvement for R&D management within firms and institutions (Calof and Smith, 2010).

Previous studies have investigated the success of improvement projects process though, for example, the effectiveness of knowledge-creation practices (Anand, Ward and Tatikonda, 2010) within organizations. In new products development contexts is common that team's members work together on portfolios of related R&D projects. To maintain a complete R&D pipeline is the key element for institutions to remain competitive in many industrial sectors. This is much more significant in the current competitive environment, where organizations have to optimize their R&D activities to address global challenges and remain profitable (Colvin, Christos and Maravelias, 2011).

3.2.5. The Research Management Staff in the European Context

In recent years, the EU funds have represented a new opportunity to increase government and different public entities income. EU funding has influenced on countries where national funds have been reduced. Indeed, the current environmental economic turbulence and the cutting in national funds, which affected most European countries, and specially Spain, may have pushed national and local areas to identify ways to raise finance for the development of RTD activities, among others. The increasing importance of EU programmes gave impetus to develop a series of strategies to access EU funds within national entities. At local level, public institutions have adopted a more European view, building up both formal and informal links with the EC, employing full time European office managers, developing specialized networks across Europe, etc. (Guderjan, 2012; John, 1996; Martin and Pearce, 1993).

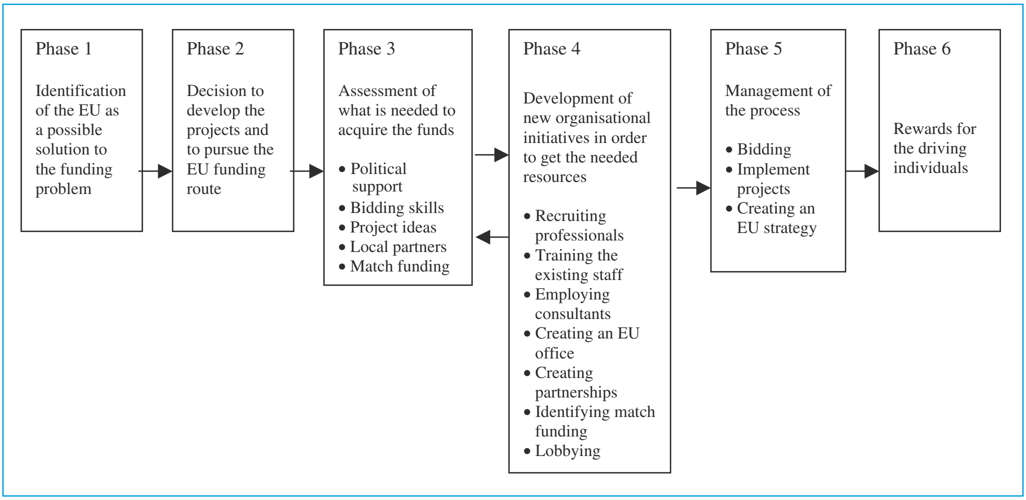
EU funding process includes new activities, which have been adopted by R&D centres during the latest years, in order to remain competitive in their fields of scope. This process leads to the identification of appropriate EU funding but also to the assessment of the resources needed for creating successful projects: New competitive project ideas, bidding skills, search for political support (at Regional, National and European level), partnership or networks, and match funds to cover the total costs of the project (Zerbinati and Souitaris, 2005). Besides, good project ideas have been crucial to success within the European Framework Programmes. The need to identify bright ideas to transform them in successful competitive applications and funds, has pressed the entities to adopt new strategies, like specific training programmes for employees, and an increasing participation in EU organized networking events to find stable partners and new funding opportunities (Zerbinati, 2004).

Writing excellent proposal –essential requirement to win the bid– is one of the most difficult parts of this process. For this purpose, many competitive public entities have employed new professional managers, experts in European competitive funding, who speak several European languages, who may have previously worked in EU institutions, and who would know in depth the diverse funding schemes. These new type of research managers have been recruited to work at the European Project Offices within the institutions, created specifically to attract European Funds and to deal entirely with EU funding. To have a skilled full-time team work on European applications, with a career trail in European funding has appeared a serious need for public entities to success in EU competitive funding. Moreover, to have a strategic plan for European calls and submitting applications and create a European strategy –an established corporate strategy with the aim to maximize the benefits from the European competitive funding– to better understand all the process, was also adopted by the most proactive institutions in European funding (Zerbinati, 2004). In addition, political support or lobby at the regional, national, and European levels by public entities has been essential to raise European competitive funds, as implemented for the Structural Funding Programme (Zerbinati, 2004). In an extremely competitive atmosphere, to be connected with the European Officers in Brussels, to best understand the EC funding policies and their annual EC work programmes priorities, is crucial to manage successfully competitive proposals. Furthermore, to establish European local offices in Brussels has facilitated lobby actions *ad hoc* and the links with the main European institutions, ensuring an appropriate feedback to both national and local organizations when submitting European project proposals.

According to Zerbinati and Massey (2008), in their study of the Europeanization phenomena of two Member States, some Regional governments established offices in Brussels and focused their activities in intense networking between themselves and with other European institutions. They identified EU grants (competitive European structural funds) as a possible solution to the funding problem. In this sense, literature on Europeanization supports the idea that the European funding was an opportunity for regional governments to solve their financial problems, compensating for the decrease of domestic regional policy support (Chorianopoulos, 2002; Hoogle, 1996; Martin and Pearce, 1993). Thus, they lobbied for their own profit, while providing the EC with expert opinion about most issues relating to the European regional policy. The need and wiliness to get EU funding projects, the common sharing of experiences and the creation of lobbies were the real added values to those networks. In one of the most successful countries in getting EC competitive structural funds, many local authorities became skilled lobbyists, locating their own offices in Brussels. They employed full-time European project managers, professional specialists in dealing with the increasing number of European networks. Contacts between the local public officers and the European ones were very important. They were also informal, non-institutional networks. In this context, networks refer to formal, institutional links between different organizational roles but also informal, personal relations between persons who are part of the networks to they belong. Thus, results showed that the more stable networks were characterized by a higher amount of funds, and effective networks –professionalized– would attract and retain members (Provan and Milward, 2001; Zerbinati and Massey, 2008). Moreover, effective networks did contribute to the building of social capital, which is basic for future cooperation and is recognized one source to success (Putnam, Leonardi and Nanetti, 1993).

Attending the European project management processes, management skills have been proved crucial to develop the funded projects (Zerbinati, 2004), since they have to be implemented following the rules of each EU programme and their time-scale. To cope with these challenging tasks, national and local institutions have created their own stable management structures, to successfully control and drive international projects implementation.

Figure 5. A Phase Model of EU Funding Model



Source: ***Zerbinati and Souitaris (2005)***

From previous research studies, success in initiating and driving the European funding process involves proactiveness, innovation, risk-taking, leadership and creativity, a mixture of attributes associated with entrepreneurial behaviour (Zerbinati and Souitaris, 2005). The decision to develop projects and follow the European funding pathway may involve innovative and proactive attitudes, and current literature in public administration supports this opinion too, defining 'innovative' and 'entrepreneurial' as a new variety of activities developed within public organizations with the aim generating additional external incomes. In the context of European competitive projects, these external outcomes may come from the competitive fund acquisition results, which may also lead to a new technology or process. This R&D results shall be protected or patented, and may bring new marketable devises or technologies into the marketplace.

European funding studies have also revealed that some persons with management competitive projects responsibility, and work for public entities, drove the European competitive funding process with an enthusiasm and determination far beyond his/her job responsibilities (Zerbinati and Souitaris, 2005). A variety of rewards were considered by these project managers themselves, who were driven primarily by professional distinguish ability and career development, seeking a higher level of responsibility within their entities. Rewards in administration managed organizations are often oriented to promotion in order to increase the responsibility levels. They were motivated by political, social and career objectives. Thus, performance-related rewards may exist in entrepreneurial public sector organizations, and they are not necessarily financial.

3.2.6. Relevant Conclusions

Assessing the efficiency of government-sponsored research and development projects, intended to stimulate the R&D progress of firms and organizations, have led to present alternative approaches and methods of performance evaluation to determine efficiency of R&D projects (Hsu and Hsueh, 2009). Studies in European and non-European countries have fond that organisational size, industry, and ratio of public subsidy on R&D budget of the granted entity significantly influences the technical efficiency of public sponsored projects. The study of different public Biomedical research funding impact have also been done –public funding aimed at facilitating the start, completion and publication of research study protocols–, through the evaluation of the grant success impact on the conduct of biomedical research (Decullier and Chapuis, 2006). Moreover, studies comparing the fate of funded protocols with those not funded, it was demonstrated that not all protocols submitted really needed funding, since they were developed and completed financially supported by other health care core payments for biomedical research.

In addition, as R&D and innovation have become central to the economy, the challenge of managing research project activities has taken on high significance and has been studied in literature. Some project management studies have focused on the impact of organizational variables on research activities, like work environment, human resource factors, and managerial practices among others (Jordan et al. 2005). But few studies have dealt with the dimensions by which research projects and needs of project team members, differ. The amount of funding designated to R&D projects, the composition and complexity of project teams, the research orientation of the group, etc. are challenges for research management, and there are also significant differences between types of projects. Thus, literature has shown that these differences may turn into the need for different research project management practices, and that management intervention can improve research performance, being organizational environment and managerial leadership conductive ways to improve research performance. Although description of some R&D dimensions that link organizational structure and management actions –and the outcomes of research and performance–, have been studied (Jordan et al. 2005), little attention has been paid to these actions applied to competitive granted projects and the managerial actions to improve the organizations success in acquiring external funding for R&D activities.

Literature have measured that researchers that received support from the public technology transfer infrastructure, and those who have active experience with the patenting system, are much more likely to apply for patents. Further, it has been argued that supportive infrastructure reduces transaction costs and information asymmetries with respect to technology transfer (Sellenthin, 2009). And the companies or institutions, which have settled research departments, use to perform better than those without. Following this argument, it may be posed that researchers, who have the adequate support from the research management offices in their R&D institutions, may be more proactive and successful when applying for competitive funded projects.

Although much has been written on the relationship between universities or research centres and their external audiences, less is known about the internal structures and their impact on that relationship (Kirkland, 2005). There remains no total agreement on the range of skills required to undertake the work of research managers, and their relationships with other staff in these entities is still under development. However, during the past two decades, research management activities have grown quickly and have been undergoing a critical and integral part of the research process (Gabriele, 1998). At present, it is undoubtedly accepted that research managers contribute to the research community by helping research groups to create a corporate climate in which new developments become more visible to them (Gabriele, 1998), by the assistance to meet the requirements of the research effort. In turbulence and competitive environments like the present one, research managers and the RMO services, have become key elements for R&D centres, which need an adequate successful R&D project management. Projects managers have become a basic tool to achieve this purpose, and their role within the process to acquire international competitive funding projects, including the implementing process of this type of projects, in close relation with R&D teams, is still under research. Due to the a small number of studies undertaken on research managers and administrators as main players –supporting structures for R&D groups– in successfully funds acquisition (especially in the pre-award phase), we find a research gap to explore. Besides, the study of the structures of the research management offices and their internal organization characteristics and motivations that may also help to increase the research groups' efficacy, is also another field of research in our study.

3.3. EFFICACY OF WORK GROUPS IN R&D ORGANIZATIONS

3.3.1. General Factors of Work Groups Effectiveness

Both society and clients claim new challenges for public research and technology organizations. Assembling the right long-term technological choices, generating and maintaining an appropriate research portfolio, speeding-up innovation processes and integrating customer and market needs into science-based research are the main current expectations to increase the productivity of R&D investments and to accelerate the business deployment of research results (Koppinen, Lammasniemi and Kalliokoski, 2010). In latest years, multidisciplinary research organizations and well-established public research and technology entities, have been then executing new processes and practices to achieve these challenges, using parallel research approaches to the business innovation process. Portfolio management and the use of business plans for long-term research programmes contributed to this parallel research process. Further, one of the challenges for a R&D organization is to have the right quantity of people with relevant business competences, while maintain the high scientific and technological ambition level for business innovation.

The capability of different entities to innovate in cooperation with other organizations can be of vital significance in sustaining and reinforce their competitive positions in the markets they operate. Organizations are able to create new products, processes and firms by sharing complementary resources knowledge and competencies (Bossink, 2002). Proactive organizations have utilized business innovation to bring the necessary changes to move from the industrial society to information or knowledge-based society. This term is included in the concept of "knowledge-based economy", which arises from the total recognition of the place of knowledge and technology in modern OECD economies, and it is referred to economies directly based on the production, distribution and use of knowledge and information (OCDE/GD, 1996). This is reflected in the trend in OECD economies towards growth in high-technology investments, high-technology industries, highly skilled labour and related productivity gain.

Within the science system, mainly public research laboratories and institutions and institutes of higher education, carries out key functions in the knowledge-based economy, including knowledge production, transmission and transfer of technologies (OCDE/GD, 1996). During the last decades, the European Commission has implemented different tools to measure the drivers, characteristics, and key outputs of a knowledge based economy, in order to enlace the innovation capability in all European countries (Arundel, van Cruysen, Hansen, Kanerva and Kemp, 2008). With the objective of remain competitive and face the challenges presented by the US and Japan, and emerging countries like China and India, the EC has established innovation and expected impact of all its granted research and innovation activities as key elements for the new Framework Programme 2014-2020 (Kalisz and Aluchna, 2012; Young, 2015).

Following this arguments, business innovation is considered to be one of the most effective ways to build the core competencies of organizations. This is why most entities are constantly engaging in business innovation projects to stay competitive and sustainable in unstable, dynamic, and uncertain global environments. Reviewing literature, there has been a steady growing order for practical and specific business innovation techniques and methodologies to enhance the chances for success (Sung, 2011). Academics and practitioners have been actively searching for critical success factors (CSF) for business innovation to make entities' innovation efforts successful, since CSF have had very significant explanatory power in the success of business innovation. Thus, under crisis economic conditions, leadership has raised the most important CSF, followed by motivation and rewards, team manpower, change management, strategy, and role of information technology (Sung, 2011). Innovation has also become the new challenge for R&D organizations to reach European funding and to achieve profitability from their investments. It could be that, as it happens in industrial companies, management within R&D organizations and centres would also approach innovation more strategically to successfully complete business innovation projects, since there are limited competitive resources and growing pressure for success under these conditions. This will include a crucial role of human resources and to set up highly skilled competitive work teams (Arundel et al. 2008; OCDE/GD, 1996).

In addition, in latecomer economies, the arrival of the knowledge-based economy has made universities to become a source of new knowledge much more significant than in the past years. Global competition and technological change also gave sense to the establishment of linkage of universities and research institutions to firms, not only to research activities for discovering new knowledge but also to support in industrialization. The universities and public research institutes have emerged as important components of these national innovation systems (Eom and Lee, 2010). Besides, with regard to the role of universities in society, Etzkowitz and Leydesdorff (1997) introduced the triple-helix model of industry–university–government relations, emphasizing the social and economic roles of universities. The interactions between the three components have been crucial to facilitate the conditions for innovation and competitive sustainability. The Triple Helix thesis argues that a university needs to be directly linked to the industry to maximize the industrialization of knowledge. This emphasizes the last mission of R&D centres and the university, which is to help for the economic development of society, apart from teaching and research activities.

It is also known that firms may select different organizational actions to perform R&D projects, thus conducting some research activities in-house and outsource other projects to independent partners, like R&D centres and institutions. This way, firms may retain different degrees of control over collaborative research projects. Literature has studied the factors that make a company's choice to subcontract research projects to academic organizations (Lacetera, 2009), and the disparity in organizational choices is characterized by the level of authority each partner retains, not in terms of the type of knowledge produced by the developed project. Academic, R&D centres and company scientists follow equal incentives and motivations. It is the control structure and the mission of different organizations that change.

The objectives of academic organizations and R&D entities consist of the production and diffusion of scientifically valuable knowledge, regardless of considerations about the economic value of a given research project. But firms aim to obtain economic profits and they have different missions and commitment rules. A scientist may be more motivated to give productive effort for a project if the project will not change its focus or be finished before completion. Such better motivation is worthy for companies as far as they can increase the likelihood of positive economic results from a specified project too (Lacetera, 2009). The main results of this analysis may be applicable beyond alliances with universities and R&C centres and can guide to a superior understanding of the overall organizations of R&D. The study of work team's efficiency within R&D centres will give us a better knowledge of research public organizations performance.

Literature has also studied employees' proactive behaviour as an increasingly important factor for organisations aiming to success in uncertain and competitive economic environments, like R&D institutions. Some studies have examined the link between leadership and proactive behaviour (Strauss, Griffin and Rafferty, 2009). Other have focused on proactive personalities which are considerably associated with proactive labour behaviour, job autonomy linked to proactive behaviour and partner trust linked to proactive behaviour by flexible role orientation (Parker, Williams and Turner, 2006). In fact, many publications argue that managers should be more proactive on the job, and see proactive behaviour as an increasingly important element of job performance. Organizational research on the antecedents and consequences of proactive behaviour has appeared in diverse studies and has taken different approaches toward defining, measuring, and understanding proactivity. Literature has addressed proactive behaviour in organizational frameworks as success factor in different type of organizations and analysed areas that explicitly addressed proactive behaviours (Crant, 2000).

Although efficacy of work groups has been extensively studied in literature, and proactivity at work has been largely considered in multiple analyses, there is not much research focused in R&D groups' efficacy regarding proactive and effective international competitive funds acquisition performance within R&D public organizations. In fact, as far as it has been reviewed, little research has been undertaken considering which factors determine international funds acquisition success within R&D public institutions. In the context of this study, proactivity will be considered as the applications for competitive calls by work groups to get international funded projects within R&D centres. Efficacy of research institutions will be linked to the success in the acquisition and gaining of international competitive projects from main European funding agencies. From this perspective, we are going to analyse different factors which literature has probed positively influence work groups' effectiveness and may also influence R&D work teams' effectiveness within public research organizations, in terms of international funds acquisition.

i. Group Composition

Following previous literature on efficacy of work groups and the research undertaken by Hambrick (2007) and Carpenter, Geletkanycz and Sanders (2004), demographic profiles of work groups within organizations (as for executive work teams as team level managerial characteristics) in the case of R&D centres, affect their cognition, values and perceptions and, consequently the centre strategic choices and the groups final performance. Diverse research studies have generated evidence that demographic characteristics or profiles are highly related to strategic choices and performance outcomes, and can be taken as observable proxies for the physiological constructs that shapes teams interpretations of situations and facilitate the formulation of strategic decisions (Carpenter et al. 2004; Hambrick, 2007). The study of demographic individual characteristics (individual attributes) and their team characteristics (composition, structure, diversity, etc.) will be a key point for evaluating their efficacy, in terms of successful outcomes for the work group itself (as decision-making team) and for the centre final performance.

In addition, top executives act on the basis of personalized interpretations of the strategic situations they face, and these interpretations are a function of their experiences, values and personalities (Hambrick and Mason, 1984). One of the assumptions is that Top Management Team (TMT) hence stronger explanations of organizational performance than focusing on individual top executive alone. Many further studies have verified that organizational performance depends on TMT composition and processes (Hambrick, 2007). But this perspective does not offer just a focus on TMTs, but attention to executive groups, who can give also valid explanations of organizational outcomes. Thus, we will consider as key actors also work groups or teams, meaning not just the TMT level, but the subsidiary teams' level like the heads of research or work groups in R&D centres, whose demographic characteristics will variables is considered in this study too.

Previous studies have also examined the impact of individual-based attributes including demographic characteristics, personal traits, objectives commitment, and efficacy, affecting groups' performance. Individual attributes and group structures play distinctive roles at different stages of groups, and the formation of group structures may also be influenced by individual characteristics. Different effects of individual attributes put forward that attributes that are directly related to, rather than general cultural values or personal characteristics, may have a more direct impact on group outcomes (Lin, Yang, Arya, Huang and Li, 2005). To form and sustain partnerships in research groups, pairs of researchers have to interact frequently to share knowledge. Individuals tend to choose collaborations based on proximity and homophile, and are inclined to select persons who are central and well connected. This way, the pool of repeatable ties forward to already established members, making intrinsically difficult for newcomers to establish ties. Young researchers and junior faculty members may likely have to make a great effort to find partners because the most productive ones may be too busy with their current collaborating partners. Academics therefore face a trade-off between joining those seeming as desirable partners (the most adequate ones for their fields of research) and attaching themselves to those who are accessible.

Studies like Triadó-Ivern, Aparicio-Chueca and Marimón-Viadiu (2012) tried to find the main characteristics of most R&D excellent groups at the University, and analysed if this profile can give conclusions about their key success factors. Their research made a comparative analysis between research groups in different fields of academic R&D activity, with the aim to recognize the differences between them and assess the opportunity of doing benchmarking with the excellent groups. Some of the considered factors to identify the main characteristics of R&D work groups were job stability, tenure, group size, quality, and quantity of the scientific production. The excellence was measured by the scientific publications. For our study, new analysis between R&D groups could be done, not just in terms of scientific excellence (via indexed publications), but also by the amount of projects gained though competitive calls –efficacy of the research institution–, and their score in the international competitive arena.

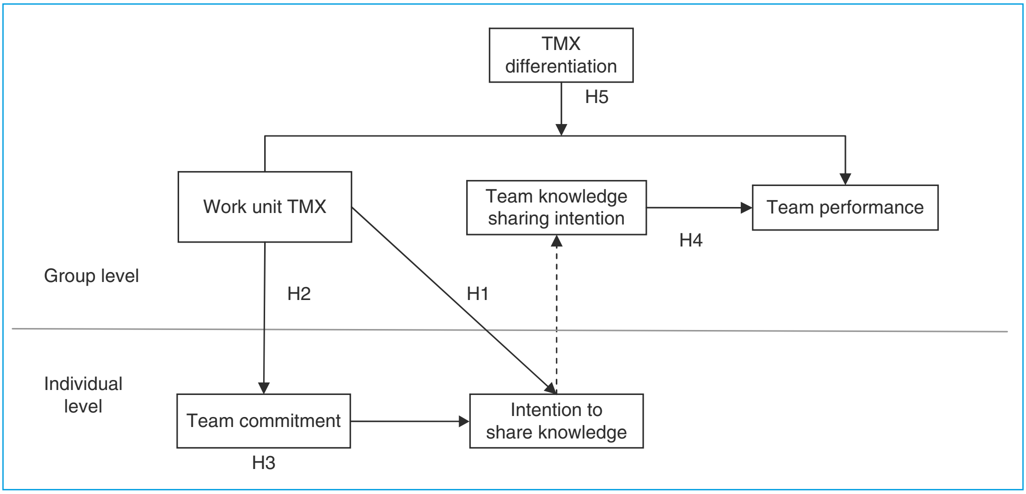
For research management staff at TTOs, an according to findings from group research that suggests that successful and effective work group should involve members of different expertise, especially when the group is at least moderately complex (Lin et al. 2005), specific demographic characteristics like professionalism, previous labour experience, educational background, etc. could be observed. In particular, in which extent these observable variables of the research management groups may positively influence researchers' final performance (Hambrick, 2007; Carpenter et al. 2004; Lin et al. 2005). Thus, studying these demographic variables could be expected to provide some new knowledge about how R&D work groups' processes may be organized and structured for getting the best performance and possible outputs when applying for international competitive funding, and how they may interact with other R&D groups to obtain successful results.

ii. Processes

Internal network relationships have been of great interest to R&D organizations and firms since they may affect group performance. Interactions within organizations may lead to many types of interpersonal relationships, emerging group's distinctive network patterns (Lin et al. 2005). Such patterns may influence the behaviour of group members' performance.

It is important to stand out the quality Team-member exchange (TMX) relationships have for R&D project team functioning. TMX, affective commitment, and knowledge sharing has been reviewed in Literature in order to evaluate how work unit TMX may influence employees' R&D project team commitment and their intention to share knowledge, and how team knowledge-sharing intention and TMX differentiation influences team performance (Liu, Keller and Shih, 2011). There are relationships between work unit TMX and employees' intention to share knowledge and team commitment. Besides, work unit TMX increases the intention to share knowledge through increasing group members' team commitment, and TMX differentiation also is a moderator of the relationship between work unit TMX and team performance. This may imply that higher work unit TMX is more probable to achieve higher team performance in a team with low TMX differentiation, in contrast to teams with high TMX differentiation.

Figure 6. Theoretical Multi-level Research Framework for R&D Projects Teams



Source: ***Liu, Keller and Shih (2011)***

The model described by Liu et al. (2011) showed that TMX can enhance researcher's commitment to their teams and increase the intention to share and disseminate scientific knowledge among team members, improving the R&D project team performance and innovativeness as consequence. The model may suggest some measures project leaders could adopt with the organization to improve team effectiveness. But few investigations have been made to better understand the relationships R&D members at group level could maintain to get higher funds in competitive project basis, and if the intention to share this knowledge and practices between the groups influence the capacity to gain international funds and resources.

In sum, for a team to be effective, it is required that the group may have their own mechanisms of growth and change, that the group may develop some internal processes that allow them to stay as a group, and that all members endeavour for integration. Further, according to reviewed literature, a proper and effective group performance requires a system of coordination and communication that may allow them to be affective in carrying out R&D tasks, while work with the organization global goals. It is necessary to determine the importance each element of the team (individual or group), has on the overall organization performance. Variables like coordination, group motivation, interactions, knowledge and skills of team members within the group and projects temporality, are basic to the team effectiveness.

In the scope of our research study, and for R&D work teams, collaboration can be defined as the near interaction between two or more scientists in a research project with one or more specific goals, including the simple objective of resource acquisition. At that, research collaboration plays a major role in improving and increases innovation potential of organizations, since R&D is an important process to create new knowledge for sustaining organizational competitive advantage. Indeed, collaboration gives access to a greater extent and depth of research knowledge than just internal development. This way, substantial empirical and theoretical research efforts have been devoted to the understanding of R&D partnerships. A big number of cross-section studies investigated the impact of R&D cooperation on group performance, and often concluded that external R&D cooperation is beneficial to entities innovation performance (Lhuillery and Pfister, 2009). Indeed, the rising number of R&D partnerships can be explained through different theoretical arguments: R&D collaborations are considered as a way to internalize spill-overs, to low transaction costs relative to market-based transactions and/or to search and absorb new knowledge fields fixed in other organizations' central competencies. Although the risk many organization face of "cooperation failures", public research organizations cooperating with other entities, can reduce these risks through previous experiences in partnerships.

Recent studies about tacit and explicit knowledge in cooperative R&D projects used industrial sources for their data collection, because most of these studies are focused on the organizations knowledge transfer impact, closely associated with the global performance of cooperative projects. Niedergassel and Leker (2011) enlarged the scope of existing research outside industry perspective evaluating the academic scientist's point of view, in order to increase the current understanding of tacit and explicit knowledge role in cooperation projects. Indeed, they studied academic collaborative projects respect to the associated knowledge and relevant determinants for sharing this knowledge, and identified differences among successful and less successful projects including mainly tacit or explicit knowledge.

For the creation and development of a successful collaborative project, partner motivation and mutual incentives are needed (Niedergassel, Curran, Leßing and Leker, 2007). Academic scientists may frequently choose whether to cooperate or not with an external partner. Therefore, it is expected that researchers generally may cooperate with partners to whom they are highly reliant on have good relationship. Through self-selecting cooperation processes, the total level of tie strength in academia can likely be higher than in industrial cooperation projects. In fact, a great rate of communication and trust is important for cooperation projects success, both for tacit and explicit knowledge and the confidence of partners seems to be especially relevant for projects involving predominantly tacit knowledge (Niedergassel and Leker, 2011). For projects involving explicit knowledge, high levels of trust are required. Thus, the interdependency between partners should be taken into account by researchers when planning R&D cooperative projects. Another question that arises from here is to know the way successful researchers in terms of competitive funds acquisition look for partners outside their work groups and centres. If they contact either potential partners (indirect ties) or they work with R&D groups they already know and with those they have had previous relationships or direct ties.

Trusts and balanced benefits between partners are the main factors to guarantee successful research collaboration (Numprasertchai and Igel, 2005). Therefore, research and development units in less developed countries research centres and universities (usually with limited internal resources and need to improve their research capability), like the case of Spanish institutions, can implement strategies for extending their potential through collaborations with external partners. Indeed, collaboration can help research teams to overcome resource limitations, achieve objectives and develop innovations. Collaboration is a key resource to acquire lost internal knowledge for creating new one and for reaching research outcomes. Successful R&D units can improve their performance by connecting internal research with high interactions among external collaborators, since effective partnerships can improve the potential of Knowledge practices to achieve products and services (Numprasertchai and Igel, 2005). The research collaboration success will finally depend on the partners' capability to build trust, commitment, and shared benefits.

Literature has studied intra-organizational collaborations setting and perseveration focused on collaborations happening within universities, like faculty publish scientific articles and grant applications (Dahlander and McFarland, 2013). Different factors are associated with the formation and persistence of network ties when talking about collaborations in written publications and grant applications. Publications and granted projects are vital to a university and R&D centre's prestige and their member's prospects for tenure. Thus, collaborations that increase the quality and quantity of published journals and competitive grants are a top resource in these organizations. Ynalvez and Shrum (2011) tested the hypothesis that scientific collaboration is linked with increased publication production. Their results indicated that publication productivity is considerably linked to professional network factors, but there is no proof of any association with scientific collaboration. In fact, most scientists do collaborate in research projects despite coordination difficulties, and without any measurable impact on their productivity. This may be due to the fact that collaborative research projects are view not mainly as a means to producing knowledge and recognition achievement, but for acquiring professional opportunities and extrinsic rewards. Following this arguments, successful research projects derived in new resources, facilitating social actions such as the generation of knowledge through presentation at congresses, workshops and journal scientific publications, or the realization of specified objectives. Additionally, this may provide new relations to apply and develop future research projects.

García-Hernández and De los Reyes-López (2007) applied Social Network Analysis methodologies to study R&D groups with high scientific production. Their analysis was focused in network properties relations with the scientific quality and impact of group scientific publications. The most central actors –the formal leader of each group– enjoyed a better position because they were relative less dependent of other groups, and they had more alternatives to get useful resources. Thus, certain degree of power for group members or centralization ejects a positive influence in the whole group outcomes and enhances group performance. Additionally, when groups have informal leaders, the groups with greater scientific impact and quality showed a strong liaison between their formal and informal leaders. Literature supports that groups with higher scientific results in terms of scientific quality and impact showed a moderate density and centrality, efficiency in its external contacts, and a strong relationship between the formal and informal leaders of the group (García-Hernández et al. 2007).

When applying for international competitive projects, collaborations are required since participation of partners from different institutions and countries is an essential formal requirement most of the time. Although the properties of network relations of scientific teams in terms of the quality and impact of scientific publications have been studied, little research has been done to analyse the properties of networks relations of scientific teams in high effective application and achievement of international competitive projects.

iii. Individuals

When studying efficacy of work groups, self-efficacy changes in groups and self-efficacy belief is a key predictor of behavioural choices in terms of goal setting, the amount of effort devoted to a particular task, and of performance in organizations (Choi et al. 2003). Self-efficacy represents a dynamic and comprehensive decision reflecting personal and task related performance determinants that may influence in the organization outcomes.

Group configuration can influence its member's individual motivations, attitudes and behaviours. In fact, literature considers the group as a social context for the formation of its member's efficacy beliefs, and variables like group composition and leadership and its characteristics may influence self-efficacy in its members. This means that influence of group characteristics on individual members' self-efficacy beliefs has been already investigated, and it has been pointed that the mechanism of group influence on changes in members' self-efficacy involves multiple pathways, including both individual and cross level processes. In fact, examples like membership diversity in education has been seen positively related to increases in self-efficacy, supportive leadership has been proved that contributes to efficacy at individual level, and open group climate contributes to efficacy through both individual-level and cross-level processes (Choi et al. 2003).

Team design and how organizations manage role responsibilities in teams is a very important issue for ensuring work groups efficacy, being needed that team members' roles and abilities are aligned (DeRue and Morgerson, 2007). Equally, identifying individuals' personal growth and development priorities and designing roles that may be aligned with these developmental priorities is critically important for improving person–role fit in organizations and consequently their effective performance. Thus, the study of the person fit in a specific environment is an important factor in the study of work groups because personal behaviour depends both on the person and on the environment, since persons develop perceptions to fit over time that conduct individual behaviour and choices (DeRue and Morgeson, 2007).

This perceived fit is especially important in work team contexts. Team members are differentially compatible with both the team itself and their particular role within the team. Individual team members' perceptions of this compatibility are the basis for person–team and person–role fit. When we talk about person–team fit we think of the perceived values equivalence between persons and their teams, and these values are intrinsic perspectives of what is right or not, being stable over time. Individuals develop interpersonal knowledge about other team members in order to create a mutual understanding among them in relation to their individual value structures. In comparison, perceptions of person-role fit are the relations between the individual person attributes and his or her role within the team, and they use to change over time (DeRue and Morgeson, 2007) according to a periodic revised set of role demands.

Work teams are composed by persons, and personal growth and development is one of the main individual needs to get satisfaction in team contexts, being individual performance a key indicator of the match between a person's capabilities and his or her role within the team. Individuals' growth satisfaction and performance are positively related to increases in person–role fit over time. In fact, the effect of performance on person–role fit is influenced by individuals' general self-efficacy (DeRue and Morgeson, 2007), establishing a reciprocal relationship between individual performance and person–role fit. Positive individual performance experiences lead members to think that their current ability is a good fit with their role within the team, so that high levels of individual performance may promote rise in person–role fit. General self-efficacy has been defined as individuals' awareness of their ability to perform across a repertory of different situations (DeRue and Morgeson, 2007). Individuals with high general self-efficacy are more expected to give good performance to their own ability, while thinking that their personal characteristics are compatible with the role they develop in their team. In fact, literature shows that the effects of performance on person–role fit are higher for those individuals with high general self-efficacy.

According to the assumption that self-leading persons may be the basic component of a self-leading team, work teams comprising action-oriented people should perform more effectively than teams with less self-sufficient members. Individual team-member performance summates into greater team effectiveness has found that high average individual performance within teams leads into superior overall team performance. Due to greater self-efficacy and preciseness, competent self-managers may dutifully release leadership roles, teamwork requirements, monitoring team progress and cross-training obligations, since self-efficacious persons in self-directed teams perform teamwork. This means that a collection of self-starting members can better develop a range of non-traditional functions crucial for effective empowered teams. Moreover, cohesion within groups induces their members to commit themselves with these team goals, since team cohesion encourages self-managers to work hard for collective pursuits (Millikin, Hom and Manz, 2010). Organizational multi-team systems comprising work teams whose members practice self-management strategies reach higher productivity, while multi-team systems consisting of highly cohesive teams of self-managers have been observed to be the most productive teams (Millikin et al. 2010). But team participants, who self-manage too independently, can danger collective performance under conditions of team disunity and lack of cohesion. Thus, employers place greater emphasis on team building that promotes emotional bonds to overcome potentially deleterious effects of extreme individual self-management.

iv. Collectivism

For R&D institutions, project forms of organizing have been theorized to rely upon horizontal as opposite to vertical authority lines, and how this change affects progression –how people progress in an organization– has been examined too (Dahlander and O'Mahony, 2011). Progression without hierarchy appears when groups assume lateral authority over project tasks without managing people. Past research suggests that the specification and granting of lateral authority roles may promote individuals' willingness to engage in coordination work, particularly in collectively managed, high-growth settings. But on a high-growth project where specialization is inevitable, some level of integration is required to avoid division. Research shows that with lateral authority roles validated and authorized by the collective, individuals dedicated to the project can be empowered to overcome this objective.

Division of labour may help to achieve better specialization within group's individuals, but concerted coordination is required to transform such specialization into group-level outcomes. High group centrality in the work-related network reflects the existence of uneven leadership roles or hierarchies, and they can help to coordinate the activities of group members, and to ensure that a group's resources are effectively used high group centrality in a work-related network is beneficial for group performance (Lin et al. 2005). Intensified communication and information sharing, as a result of increased group density, can also enhance group cohesiveness and improve decision-making, leading to improved group performance. Further, previous research argues that groups that are composed by members with high level of capability tend to increase their performance in-group task, and those composed with collectivistic members (team less preferences by members) tend to be associated with higher group performance. In addition, in dynamic contexts like the R&D ones, an elevated degree of group division may help the group to become more efficient and effective when facing tasks that requires high coordination. High level of members' efficacy may also influence positively groups' performance. Nevertheless, a group is highly effective when individual member's objectives are aligned to the group goals.

Social characteristics within a group operate as ambient group stimuli that apply cross level influence on member performance, including changes in their self-efficacy beliefs. Literature also has found that changes in self-efficacy have resulted to be a significant predictor of behavioural change, and it mediates the relationship between learning and performance (Choi et al. 2003). Group-level variables as shared norms, collective mind and group information processing can be characterized as properties of the collective entity. With regard to group climate, when it is made by open communication and trusting relationships among group members, this may be related to positive changes in members' self-efficacy because climate will allows experimentation with new ways of doing things, the practice of new skills without fear of appraisal, and frequent and open exchanges of feedback. This will also increase self-efficacy subsequent to the group team.

Understanding team members' group or collectivistic orientation to group goals is also important for developing cooperative and productive work teams within organizations like R&D centres (Eby and Dobbins, 1997). Organizations are increasingly using work teams to make more efficient their processes, to foster employee participation, and to improve quality outcomes, since it is expected that within a team, as the proportion of members who show collectivistic orientation rises, team member cooperative team behaviours will increase too, and in the end, team performance. Collectivism may impact cooperation because limits on appropriate behaviour within work teams are established, and cooperation between team members make clear members' expectations and facilitates them the best allocation of effort and resources, while making possible task fit. Particularly, as the proportion of team members with a collectivistic orientation increases in the organization, so does the probability of cooperative team behaviours, and finally team performance. Team cooperation will then influence the relationship between team collectivistic composition and team performance.

Literature has also explored the relationship between individual characteristics and self-reported collectivism, in order to determine whether team collectivistic composition is related to team cooperation and effectiveness. Collectivistic composition has been examined as in relation to group processes and performance, being reasonable to think that some individual motives and values may be related to pull collective activities. Much previous research has focused on the role that efficacy expectations play in affective reactions toward a task, motivation for engaging in a task, and performance (Eby and Dobbins, 1997). Following this idea, member's belief that he/she possesses skills necessary to function effectively on a team is related to the individual preference for work in a team environment. Collective tasks provide the chance to share task responsibility with other members of the work team. Consequently, group-based tasks may be more attractive to individuals with an external locus of control, since externals have a propensity to view their performance as a function of other factors than just their own efforts. Nevertheless, positive past experiences referring to work in teams influences individual future expectations, which in turn enhances the attractiveness of work in a team setting (Eby and Dobbins, 1997). Positive past experience work in teams will be positively related to the team member's collectivistic orientation. In addition to a person confidence in his/her ability to successfully develop a particular action or self-efficacy, the perceived controllability of the environment, and his/her past experience in work teams, it is accepted that individuals have difference needs to be fulfilled, which may be reflected in differentially desired outcomes. One reason is the need for engaging in activities with other people in order to maintain positive social relations. Work with other member's in-group settings provides the opportunity to meet these affiliate needs and, thus, it can be said that the need for social approval may be associated to one's collectivistic orientation (Eby and Dobbins, 1997). Team collectivistic orientation is considered related to cooperative team behaviours, and they act as a mediator of the relationship between team collectivistic orientation and team performance.

Since team's collectivistic composition may affect team performance by impacting on team cooperative behaviours, individual attitudinal variables may also play a key role in fostering coordination and cooperation among team members. When individuals face with a task that requires interdependence and teamwork, like in the case of R&D projects development, collectivists due to enhanced motivation and task concern exert more effort. This motivation may emerge due to the inherent appeal of group-based settings for collectivists, who may also foster attachments to the group, internalization of the group's goals, and enhanced commitment to it (Eby and Dobbins, 1997). Literature highlights that the exchange of effort and information within the team leads to appropriate goal setting, which then enhances performance.

Previous studies confirm that positive relationships between efficacy-related cognitions and performance are less consistent at the group level than at the individual level, with the impact of group-level cognitions influences by the characteristics of the task and cultural context. These factors are related to the nature of the information that is switch in-group teams. When task uncertainty is high, team members use to work independently and collectivism is low, while group efficacy is not related to group effectiveness. In contrast, when groups know what task is required to perform, like may be the case of some international competitive funded R&D projects, they work interdependently and valued collectivism, and the relation among group efficacy and group effectiveness is positive (Gibson, 2001). Effective collaboration in the use of information between individuals is a principal source of organizational benefits and competitive advantage for organizations. Knowing that teams are a key learning unit in modern organizations, to understand collective cognitive processes may have important implications for organizational knowledge management and learning too, and the establishment of a structure for collective cognition can help organizations to enlarge the effectiveness of work teams (Gibson, 2001). Given the current trend toward incorporation of teams into knowledge management operations, this understanding may go on the way to increasing the effectiveness of complex institutions like R&D centres.

Cohesion can be understood as the degree group members wish to belong to their work group and the commitment and involvement are a reflection of individual identification and responsibility feelings to the group or organizational goals. Reviewed studies have been trying to find a way to match individual and collective goals, in order to facilitate effectiveness and organizational performance. Thus, teamwork quality consists of team cohesion, mutual support, and within team collaboration, it helps multi-team R&D projects by expanding component teams' ability finish their design work on time and within budget, inter-team coordination, and shared commitment to project goals. Culture of commitment and involvement are both directly related to cohesion. When commitment exists within a research group, the members feel successes or failures as their own personal results, and they can even perform actions without the close supervision of mangers. Consequently, individual self-management is most conducive to team performance when teams' collectives are cohesive. Researchers who trust their peers may fully apply their resources toward the group's task (Millikin et al. 2010). Because component teams perform best when members are both self-reliant and bonded to one another, R&D centres comprising such teams should outperform others whose teams are divisive or lack competent self-managers.

In regards to group motivations, team members within R&D institutions are expected to develop the confidence of work together to be motivated, and it is also needed for members to be committed with the objectives of the group in order to fully success. Motivated group members develop tasks, which require a range of members' skills, produce significant results both collectively and individually, confer autonomy to members' in-group activities, and provide direct feedback. The group may also provide together the knowledge and skills required by the R&D tasks, which implies that members may hold a variety of skills and abilities. In R&D teams, which use to perform complex tasks, these may be considered something divisible. In sum, for a research team to be effective, it is required by the organization a good time planning, and by the individual members' time commitments (projects fulfilment beyond the lifetime of the project tasks they can collectively develop).

v. Incentives

Two classes of motivation have been determined for work groups: extrinsic and intrinsic motivation. Extrinsic motivations are focused on results reasons, like rewards or benefits earned when developing an activity (Osterloh and Frey, 2000). Intrinsic motivation indicates the enjoyment and internal satisfaction originated in persons from a specific task or activity (Deci, 1975). Both forms of motivations influence individual intentions regarding an activity as well as their actual behaviours (Davis, Bagozzi and Warshaw, 1992; Lin, 2007). Moreover, some scholars have argued that intrinsic motivation is positively linked with creativity, and that intrinsic motivation promotes knowledge sharing, since intrinsically motivated employees are more likely to share knowledge (Lin, 2007).

According to Millikin et al. (2010), in high performance organizations (like R&D institutions), team turn out to be the primary unit of performance. But to study what differentiates effective teams from others less effective, undertaken research has considered a range of team members' self-management competencies and how team composition of such individual skills translates into greater performance for multiple teams that interface and interdependently carry out collective objectives in organizations (named multi-team systems). When individuals display more self-discipline over their conducts, they build intrinsic motivation by acting independently and assuming ownership for collective outcomes, and mentally cope with frustrations, improving personal and team performance. Investigations have observed that average individual self-management levels within teams may improve collective effectiveness, enabling functional professional teams to perform better. Further, intrinsic motivation via self-initiated task redesign can also enhance collective effectiveness and team performance. Team members can use natural reward strategies to motivate themselves too, by embedding intrinsic rewards into their daily work, getting constructive thinking strategies (Millikin et al. 2010). Self-starting, persistent, and action people, spontaneously creates situations in which they work to intrinsically motivate themselves for achieving higher performance, thus becoming more self-directed.

Team members' attitudes towards preference for team work and perceived efficacy of teams has been studied in relation to different rewards distributions in organizations (Shaw, Duffy and Stark, 2001). Researchers have also been interested in determine what factors make workers more proactive to team-based payments. According to Kuhn and Yockey (2003), variable payment is preferred when incentives are based on individual rather than collective (team or organizational) performance, and researchers were more optimistic about the likelihood of receiving incentives as persons, since they were much more likely to trust their own performance rather than an uncertain work team, no matter the team size, or the global success of the whole entity. But attitudes toward group work may reduce this effect. In fact, similar to findings that collectivist-oriented staff has more favourable attitudes to team-based recompense systems, people who like to work in groups are more confident about group performance and less reluctant to accept pay risk based on team collective performance (Kuhn and Yockey, 2003).

For the successful development of a research project, the work group may be of a certain size. But the team has to be able to face problems of mutual interest, sharing ideas between members, resources and co-authority publications. In addition, factors like institutional support, job security, and funding have been probed key promoters for early career investigators. International collaboration among early career researchers is a feasible and effective means to address important challenges, by increasing opportunities for professional support and networking, problem solving, discussion of data, and ultimately publishing. Cruz-Castro and Sanz-Menéndez (2010) focused their research on mobility and rewards for scientific performance in the form of tenure and permanent jobs (job stability) in Spanish universities. The acknowledge evidence that mobility of scientist enhances their career path in early phases of academic career (PhD researchers, junior researchers, etc.) shall be considered, although this relationships may vary across countries.

In regards to collaboration, and ties formation and persistence, institutions may find ways to reward collaborations between groups that often go ignored or unrewarded (Dahlander and McFarland, 2013). Interdisciplinary organizations managers can generate persistent ties by bringing visibility to collaborations who may extent research groups and do not obtain the recognition of disciplinary scientific journals.

Empirical research aimed to examine the complex mix of motives driving the behaviour of scientists, led researcher to attend the impact of financial incentives on scientists' propensity to engage in commercialization, providing diverse proof about the role of funds as a motivational driver. Thus, when talking about commercial approaches, there is a diversity of motivations for researchers to get involved in business activities derived from their scientific results. Most of them do so for reputational and intrinsic reasons, and financial rewards may be of relatively importance (Lam, 2011). Researchers with traditional beliefs about the division of science from business are more expected to be extrinsically motivated, using commercialization as a means to obtain resources to support their mission for the career rewards. In contrast, those more close to entrepreneurial norms are intrinsically motivated by the independence and intrinsic pleasure involved in applied commercial research while also motivated by monetary rewards (Lam, 2011). This way, researchers can be extrinsically or intrinsically motivated to different extent in their follow of a specific activity, depending on how far they have internalized the values and regulatory structures related to it. If R&D organizations willing to support commercial engagement should build on reputational and intrinsic motivations rather than purely financial ones, it may be expected than other type of outcomes could be also achieved be rewarding activities like the purpose of rising competitive funds within R&D teams.

Since actors benefit from a large variety of information, it is important the information could come from trusted sources (strong ties), especially if the information is complex, like in biomedical R&D projects. The positive effect of strong information network ties, match with the suggestion that in situations of complex knowledge requirement, people who are able to rely on strong ties will experience improved performance as outcome. This results on higher rewards because it helps employees doing a better job. But in networks of superiors, it is worthy to have strong ties that are densely connected because performance evaluation may have a more discretionary side which may lead some actors to earn more favourable evaluations and be rewarded above and beyond what their objective performance would otherwise indicate (Mizruchi, Brewster Stearns and Fleischer, 2011). Literature showed that both tie strength and network density play significant roles in the determination of rewards in networks used to extract information, but not in those used to generate approval for one's project.

Furthermore, well-connected persons in a network may tend to contribute to the development of significant knowledge. Well-connected individuals obtain information and insights from many others, of higher correctness, and are more innovative than members who may be placed less strategically (Aalbers, Dolfsmab and Koppiusb, 2013). Well-connected persons can collect and give existing information more quickly, but can also combine current ideas and knowledge in a new way, being creative. The more individuals are in habitual contact with one another, the more probability they will develop cooperation and will act collectively. It would be desirable that intrinsically motivated individuals will be well connected within organizations, so scholars have hypothesized that intrinsic motivation is a valuable predictor of an individual's connectedness in the innovative knowledge transfer network. Following this argument we could presume that intrinsic motivations may affect TTOs staff and researchers within R&D entities too, since they may maintain habitual contact and probably develop cooperation and collectively.

Mizruchi et al. (2011) extended previous analysis focused on the relation between networks and performance. They argued that networks might affect rewards by improving performance as well as by generating support from employees' bosses. On this literature, networks based on collegial relations from those based on authority were distinguished, and they also analysed the importance of distinguishing those network determinants that improve performance from those that create favourable evaluations independent of performance. In fact, the division of performance and reward showed that networks have a double nature: Networks based on information from collegial relations provide opportunities for improving outcomes; and networks based on support obtained from relations with one person superiors provide opportunities for favourable treatment, independent of performance. Both of these advantages manifest themselves in higher rewards.

vi. Networks

University and R&D institutions capability for collaboration with other agents have largely been study in the particular case of industrial agents. This collaborative capacity has been analysed in relation with size, location and research quality though the high impact of scientific publications (Abramo, D'Angelo and Di Costa, 2011). Diverse previous investigations have focused on the impact of research quality of universities in comparison with geographic distance on the capability for cooperating with industrial firms. The excellence of the R&D groups has been proved to be the most important factor in explaining the capability for collaborations with industry. Further, successful collaborations between university or R&D institutions and industry have been demonstrated to have many shared benefits (Zucker, Darby and Armstrong, 2002). In order to recognize these benefits, both parties may need successful governance mechanisms to get over institutional and cultural barriers. Internal alliances provided with contractual engagements and organizational commitments allow associated partners to initiate more explorative R&D, to organize interdisciplinary projects with faculties in different research fields, and to establish larger scale R&D projects (Lee, 2011). Effective research partnerships have provided universities and research centres with significant research funds and opportunities for the practical application of their results, enabling faculties to increase insights into new research areas. Research partnerships enable industrial firms to absorb basic knowledge crucial for future innovations too, to solve technological problems in products and processes, and to achieve access to decisive human capital (Lee, 2011).

The capacity to produce and develop creative ideas for new products, in order to fulfil the market needs, is a key element to guarantee the success of any sort of institution. When talking about R&D institutions, research project teams have become the essential units in organizations to generate creative ideas, and to transfer their ideas into useful technology, goods, and services (Chen, Chang and Hung, 2008). Further, the current increasing rapidity of new knowledge generation and the progress of current economies in latest years have implied a growing specialization of persons in specific areas of knowledge. This development makes cooperative R&D projects a crucial tool to stay up-to-date of the latest technological tendencies, in particular in R&D intensive fields like the biotechnological one (Niedergassel and Leker, 2011). Additionally, cooperation denotes an important way of obtaining external knowledge, being bigger the amount of R&D partnerships created during the last years.

BakkerKnoben, de Vries and Oerlemans (2011) studies showed that the general prevalence of inter-organizational project collaborations in organizations remained important and stable over time, despite the economic crisis. Moreover, these firm associations mostly solved repetitive rather than unique tasks, and had been fixed in previous relations between the involved partners. As industrial organizations look for flexible ways of production in the current changing economic environments, inter-organizational project associations have become a gradually more significant form of organization. Project work (including the R&D projects tasks and milestones), often requires the participation of external partners (Maurer, 2010), which provide organizations with flexible network solutions by limited duration partnerships.

For R&D collaborative projects within R&D institutions could be applied the same patron as for industrial firms. Outside project partners are needed for proper R&D projects development, since they may bring a source of new knowledge about technological developments to put on the market. One effect of inter-organizational project work is the acquisition of new knowledge and its exploitation into new products, which may increase business opportunities. Trust improves access to such knowledge by increasing project partners' motivation to share knowledge, and it facilitates the achievement of new ideas and insights towards further product innovation (Maurer, 2010). But, within R&D institutions, as entities with multi-unit structures with relative autonomous research departments or areas, there can be a lack of awareness of each other activities at personal and at unit level, limiting communication and knowledge-transfer between the groups. This lack of connection and collaborations among R&D areas could also limit cooperation for setting up projects and develop joint research activities. Moreover, the lack of relationship between researcher from different areas within the same R&D institution and even with other external research areas may restrict the formation of associations for project development and could decrease intrinsic motivation for applying to competitive granted projects too.

The strength of weak ties study by Granovetter (1973) is a reference for many investigations related to the power of ties. According to Granovetter research (1973), the degree of two persons' friendship networks varies straight with the strength of their tie to one another. It is through these networks that small-scale interaction becomes translated into large-scale patterns (diffusion, social mobility, political organization, and social cohesion in general), and that these, in turn, feed back into small groups. Literature has proved that the strength of a tie is a combination of quantity of time, emotional intensity, intimacy and mutual services. Moreover, weak ties presented to bring benefits of information in his study about occupational opportunities, since workers found jobs easily through weak ties, and through these links new information and ideas are transferred. Although tie formation is mainly a function of opportunity and preference, collaborations persist in a context of known partners, and they may continue when the persons are fairly close, have similar knowledge, and a have the sensation they share similar history. Literature suggests that ties appear when new people identify desirable and matching characteristics in potential partners, and ties continue when familiar persons reflect on the quality of their relationship and mutual experiences. Thus, tie perseverance is more a function of duty and complementary experience than opportunity and favourite choice (Dahlander and McFarland, 2013).

Regarding to the knowledge transfer between work teams, Hansen (1999) posted that when knowledge is complex, strong ties offer superior results than do weak ties. But Reagans and Zuckerman (2001) found that within a work group some density for good coordination is needed and at external level a thin network could avoid information duplicity. Besides, networks connectedness is a very important factor for R&D groups' performance because their linkage can increase their scope of knowledge and as a result may improve their efficacy and competitiveness (Harvey, Pettigrew and Ferlie, 2002).

For projects development, entrepreneurs use to contact with potential investors with whom they have previous relationships or direct ties, or to whom they are referred or have indirect ties. But they may face doubts in trusting on pre-existing network ties. Literature studied the factors that influence entrepreneurs' choice between using familiar networks in opposition to market methods (Zhang, Souitaris, Soh and Wong, 2008). The results showed that high occupational position and significant work experience are positively associated with the entrepreneurs' tendency to use current networks by using their network ties or social capital. Nevertheless, those influences are decreased by entrepreneurs' managerial experience, which increases the entrepreneurs' ability to interact with others (one characteristic of social competence). Entrepreneurs may turn to choose "market methods" when they do not know their partners direct or indirectly before starting a potential business trade. In this senses, senior positions are usually related with good and useful network ties due to the fact they represent an individual's social position (Lin, 1999, 2001), and because persons who have top positions in a hierarchical social structure have bigger access to different resources and can better control them. Additionally, they have direct control of more resources and also obtain access to other individuals in analogous positions in the hierarchy (Villanueva-Félez, 2011). These persons can either direct provide financial capital (direct ties) or provide associations with potential partners (indirect ties) (Zhang et al. 2008).

Different organizations tend to foster the maintenance of existing collaborations and are less interested in creating an expanded their portfolio of new partners. People tend to stick to the ties they have previously formed, especially stronger ties that are complex and span multiple types of association. Repeated collaborations have less start-up costs than new ones, they give greater certainty and trust, and people engaged in long-term ties use to communicate better (Uzzi, 1997). Tie creation and tie persistence stand for qualitatively different phases of relational decision-making and a shift in framework quite insightful for studies of social networks and organization theory. Since tie formation and tie persistence are central factors of organizational life in all institutions, a successful range of ties has to be expected to include a mix of new and lasting ties (Dahlander and McFarland, 2013).

In addition, individuals maintaining a larger number of diverse contacts outside their own unit, allows themselves to better contribute to the innovative capacity of their organizations. But workers of an organization tend to interact with others in their immediate surrounds, since interacting with others beyond the known contacts or to whom one would meet frequently is more costly (Aalbers et al. 2013). Establishing and maintaining ties is also time consuming and to invest in one's network may become loss making, particularly when workers are already supporting other complex ties. In fact, multiplex ties, being beneficial to innovative knowledge transfer, and in which the same people connect through diverse networks, are less probable to be developed between individuals from different units. Levels of trust may then be lower between individuals from different departments who interact. Interactions between individuals from the same department use to have a higher prospect of outcomes, and interactions between individuals from different departments may produce a more radical result, but the chances of the materializing that result can be lower.

Following previous arguments, social capital is defined as total current and potential resources that people get from their direct or indirect ties in social networks, and rich social capital indicates a "resourceful network" for the main actor (Lin, 1999, 2001). Besides, human capital includes knowledge, skills, and abilities that persons have acquired through work and educational experiences (Becker, 1993; Burt, 1992). The investigation of how bonding and bridging social capital influence knowledge sharing and project performance show that team members with elevated bonding social capital are expected to share their knowledge with their work team, and bonding and aim to share knowledge positively affects project results (Han and Hovav, 2013). Some studies suggest that project managers should establish teams composed of persons with diverse social links and think of the equilibrium between bonding and bridging within a team, in order to overcome the possible disadvantageous effects of bridging social capital.

Researchers have used the idea of social capital to describe a wide variety of social phenomena (Burt, 1992; Coleman, 1998; Jacobs, 1961) such as the development of human capital and intellectual capital, knowledge and technology transfer at industrial levels, company social capital and liability, etc. Social capital means the body of resources that has positive results to project work team members throughout the member's social relations, facilitating the achievement of outcomes (Chen et al. 2008). Relationships are created across interactions between team members, and the model of linkages and the relationships created are the basis for social capital. The concept of social capital is associated with social communication, network ties, reliable relations, and worth systems that ease creativity inside project team backgrounds.

Human and social capitals are positively related and for entrepreneurs they play the most significant role in attracting financial and other resources. Literature suggests that the two types of capital are complementary to each other in that bigger human capital leads to increase social capital and *vice versa* (Lin, 1999, 2001). Indeed, previous studies have showed that the sole, valuable, and non-imitable human and social capital help entrepreneurs to acquire financial capital helping the organization survival. Human capital not only shapes and is produced by social capital, but it influences the use of social capital.

According to Murray (2004) the origins of an inventor's most critical social capital can be found in his career course and includes two elements. Firstly social capital founded on his own laboratory network. Academic and research laboratories exhibit a high sense of the laboratory context and the importance of mutual joint experiences with current and past members of the work team. While patents, publications and co-publications are diverse measures of productivity and scientific results, for technological based companies they may provide insight within the human capital used by them to create these outputs. Such human capital makes the inventor a potentially central actor in the transfer and technology and commercialization of his scientific ideas. Secondly, the social capital can be also founded on scientists and researchers cosmopolitan network. As with their human capital and local laboratory network social capital, scientists generally construct their international network through their career pathway; achieving access to the Academia through a tutor and distinguished research activities. This wide social organization within the scientific and research community gives scientists with a multinational network of equals and contacts (Murray, 2004). Indeed, for academic inventors, their international network conducts to research cooperation and facilitates high amount of co-publications with diverse and extensive research groups. Senior scientists set up a reliable group of colleagues to ask for information and counsel about certain problems and challenges. One key characteristic of senior or “star” scientists may be the intensely embed connexion to the community. Thus, literature suggests that scientific careers are also essential in determining an academic’s social capital. While the contribution of human capital comes from the exchange of tacit knowledge and personal status, the exchange of social capital drives technological institutions to become embedded in the scientific community (Murray, 2004).

Chen et al. (2008) studied the function of the social capital in creativity for R&D project teams given a certain context. The completion of project tasks with success will depend on project team members’ selection with varied and complementary knowledge, skills and capability, as well as in supervising social interactions to reach common outcomes. Project team members need to interact between them to switch, transfer and disseminate knowledge that will allow them to create new characteristics and technical solutions for invention design to problem solving. R&D project teams know that interexchange of information and knowledge facilitates problem solving, decision-making, and ideas creation. Thus, communication and dialogue may permit R&D work team members to find creative solutions related to their tasks. These networks of relationships are a worthy resource for the conduct of social relationships, providing team members with jointly owned capital and ensuring success. This way, network ties may be tools for approaching information and different resources, being an important source of information benefits. Results suggested that social interaction and network ties had significant impacts on creativity of R&D project teams (Chen et al. 2008), thus investing in the creation of social capital within R&D project team finally produces creativity. Additionally, the brokerage networks can benefit the team with large views from outside contacts, but this can also produce excessive or too duplicated information.

Collaboration in national and international academic research has being growing during the last decades. The generation of new knowledge is every time more and more complex, and researchers from different fields of knowledge progressively have been work together to achieve their scientific objectives. The degree of organizational cooperation is extraordinarily high in Life Sciences, reaching an outstanding importance the cooperation between researchers in this area (Smith and Katz, 2000). Studying collaborative R&D projects in the natural sciences may bring interesting results, relevant for research policy makers (Niedergassel and Leker, 2011).

Indeed, collaborations are particularly frequent in Life and Natural sciences due to the need of scientists and researchers to access new instrumentation and undertake complex problems which would be too difficult for one person alone to resolve or explain. And collaborative partnerships form in a context in which researchers approach a broad variety of unknown potential partners and choose those who are close, have identical character and similar knowledge, and who show a level of social success and evidence of interpersonal confidence (Dahlander and McFarland, 2013). In fact, in many industries like biotechnology, firms form inter-organizational projects (focal project team from the head organization and several external project teams from specialized partner firms or subcontractors); they share risk and facilitate resources to jointly develop new products and services which none of them could do separately. For inter-organizational projects to succeed trust between the projects work team members of the central organization and its external project associated have been proved of crucial magnitude (Maurer, 2010). In general, trust has been seen to strengthen and improve the connection between project partners, which implies many benefits for the project as a whole.

International alliances are important, as a way of internationalization for research sectors like Biotechnology, due to the intense international competition for knowledge and intellectual property rights. Besides, international research partners are a need for R&D centres in order to access international funding for developing projects. Indeed, when applying to European competitive funding programmes, researchers within R&D institutions need to establish contact with other research groups to form an international consortium. Following Villanueva-Félez (2011) and Zhang et al. (2008) previous studies, it could be expected that senior scientist may have better access to external contacts when trying to join an international consortium. With high occupational position and larger work experience (long tenure and high scientific background) within the R&D group, they may use their networks ties or social capital to form good qualified partner associations and to join advantageous international project teams. Due to their large experience, they may also have previous experience in European funding programmes, with higher knowledge of the best groups in his/her fields of activities.

Diverse studies highlighted the importance of networks as a mean of internationalization for organizations, via research alliances, distinguishing local from national ties (Al-Laham and Souitaris, 2008). The probability of an entity to form international alliances is positively associated with the number of previous links it has with regional research institutions. Firms with contacts in local knowledge centres are attractive potential partners for other foreign entities. Research networks of the local partner may increase the association likelihood by raising the visibility of the firm as a reliable associative partner (effects on signalling and good reputation). Further, the amount of previous national research alliances the entity may have increases its probability of entering into an international alliance too (Al-Laham and Souitaris, 2008). In addition, firms with a central position in the national network have higher chances to build international alliances too. Central entities are the ones with more ties or associated with more and better-connected partners, and they signal reliability that may encourage a positive assessment by a potential foreign partner (Al-Laham and Souitaris, 2008). Thus, a central position in the network can increase a firm's capability to establish partnerships, since they have access to rare information and to better knowledge about potential partners and collaborative opportunities. Reputation is important in the organization for future ties, because these social affiliations serve as a source of legitimacy (Uzzi, 1996). The signalling properties of the centrality in a firm's network are mostly important for knowledge-based entities and for cooperation across national borders.

Broström (2010) studied the role of geographic proximity for interactions on R&D activities, exploring the case of official university–industry interaction in one industrial sector. It was probed that ties formation in geographical proximity is more probable than far-away linkages to produce impulses to innovation and create significant learning effects at institutions. Moreover, geographic proximate contact are more likely to successfully contribute to R&D projects with short time to market, but for long-term R&D projects, geographic proximity is consider a less critical factor.

In national and international partnership relations, repeated alliance actions contribute to the rise of alliance management abilities, since the more relationships an organization has, the more it knows about managing them and it is less costly for the entity to build new relations and partnerships. When talking about alliance capabilities, literature suggests that association with distant partners at the national level gives different and higher benefits than local research alliances. In addition, from the international partner's point of view, an entity with multiple national alliances is an attractive potential partner because these alliances are a signal of better access to technical knowledge capability and add enhanced reputation (Al-Lahamand and Souitaris, 2008). Following this argument we could post that for researchers of R&D intuitions, to have previous national alliances may benefit the contact of international partners, enabling the arrangement of international consortiums and facilitating the application to international research projects. These studies have showed the benefits of starting national cooperation before entering into international alliances. Acquisition of experience at the national level may allow organizations to build up beneficial capabilities for future international research partnerships.

vii. Group Structures

Due to the current economic crisis, both the U.S.A. and Europe Administrations have implemented ambitious recovery programmes to re-establish their economies. The translation of the needed financial and technological investments into employment creation and economical productivity growths also made companies to develop a complementary full commitment of diverse workforce expertise to solve innovation and existing problems. Diverse work teams formed by individuals with heterogeneous education, experience and knowledge have been increasingly demanded to take advantage of their higher skills in complex decisions making situations and for performing difficult knowledge-based works (Rico, Sánchez-Manzanares, Antino and Lau, 2012).

Research productivity is a need for the survival of R&D teams an organizations and it can be measured attending the number of patents granted by researchers, the number of products the team may have in development, and the amount of technologies put on the market (Siegel and Phan, 2005). Ties between “star” scientists and company scientists have been probed to have a positive effect on these three determinants of research productivity, together with other dimensions of firm performance and results. In fact, active, self-interested participation of discovering excellent researchers is a vital condition for successful licensing of inventions in most academic and R&D institutions (Zucker et al. 2002). The researchers at the very top of their scientific discipline are the ones most probable to essentially change the way things are done in their science group and in its commercial applications. In Zucker and Darby (2007), the authors examined detailed data about the outcomes of collaborations between “star” university scientists and biotechnology firms. In European countries researchers conduct much of their works within national institutes and the scientists are full-time staff and even more controlled than in other university professors in their ability to personally income from their ideas commercialization. Best national innovation systems are those in which science breakthroughs are translated into major marketable innovations by main scientists and their research teams. Moreover, the excellent researchers who were involved with firms considerably augmented the quantity of scientific articles published, maintaining or even increasing citations per article (Zucker and Darby, 1996). Thus, advances in science led directly to business success, which led directly to further scientific advance (scientific indexed articles) and commercial success too.

For group structures, diversity denotes the degree to which there are similarities and differences between team members. Research in organizational diversity has been dedicated to diversity in gender, age, ethnicity, tenure, and functional background. The main question in diversity studies has always been the way diversity affects team performance. Team composition treats on diversity or within-team heterogeneity, and the degree members of a work team are similar or different along different attributes, such as gender, ethnicity, age, education, culture, functional experience, etc. (Perreti and Giacomo, 2007). Research on diversity asserts that variations in the demographic and social composition of teams affect group processes and in the end it influences group effectiveness on diverse results, like performance or innovation.

Flexibility and organization of diversity within R&D centres may contribute to the right implementation of the team members, as the context in which the activity is developed influences individuals' behaviour. The past experience of researchers and the experiences they acquire are also important. But if the research team is not properly structured, there may be a blocking effect in the interactions between its members. Instead, if the structure is good, implementation processes are easily provided. Cohesion, roles and norms are important aspects of work teams' structure.

Managing diverse work groups is one of the most difficult things and serious challenges in contemporary organizations. The conventional focus of diversity research has been on connecting demographic differences among team members, such as age, sex, or race, to reactions toward team-level functioning and performance. These "surface-level" demographic characteristics are easily observed and measured. They are presumed to be important because of the underlying differences they are thought to reflect, and because they can evoke individual prejudices, biases, or stereotypes. But a complementary paradigm began to emerge involving the investigation of deep-level (Harrison, Price and Bell, 1998) or less readily apparent diversity. This form of diversity has been based on psychological features of work team members and it includes individual differences, such as personality character and principles, as well as attitudes, preferences, and values (Harrison et al. 1998).

Diversity can also be analysed from the perspective of time, as vehicle for collaboration in teams, which allow exchange between members' personal and task-related information (Gavin, Price, Harrison and Florey, 2002). These studies highlighted the importance of time, since stronger team reward contingencies will stimulate collaboration and as time passes; increasing collaboration will decline the effects of surface-level (demographic) diversity, but will strength the effects of deep level (psychological) diversity on team results. Moreover, perceived diversity transmits the impact of real demographic and psychological diversity on team social integration, and social integration may also affect task performance.

According to Shin and Zhou (2007), employee creativity is also a decisive variable for success in organizations, being diversity one of the most important factors for team creativity. For creativity of R&D teams, educational specialization heterogeneity has been proved to be the most applicable heterogeneity variable, since it provides different perspectives, knowledge, and skills for teams to be creative. When team members have high levels of efficacy expectations in terms of creativity, they are expected to achieve high levels of it. With high levels of common thinking about their team's creativity capacity, the R&D team members are likely to exchange and share their perspectives and to combine them into something new and helpful (Shin and Zhou, 2007). Thus, teams with high creative efficacy are more likely to achieve proper team creativity-related processes, to achieve high levels of team creativity, which may impact in the overall team performance and in the desired outcomes in the research centre.

Group homogeneity has been settled by investigators as an influence variable for research work team performance, meaning variables like increased presence of women in the workplace, researchers diverse in age, researchers from other ethnicities and cultures, different skills training and abilities, etc. In fact, some studies have already provided analysis about the initiatives promoted by international competitive award programmes like the National Institute of Health (NIH) in the USA, for promoting diversity of gender in the research labour force (Reineke Pohlhaus, Jiang, Wagner and Schaffer, 2011). Success and funding rates for men and women were not notably different in most of these award programmes, but both application and funding rates were generally higher for men than for women, remaining sex differences within R&D groups that affected team performance.

Some investigations are in favour of team homogeneity, while others supported team heterogeneity. According to literature and social categorization theory (Turner, 1987), some individuals prefer to cooperate with others of similar attributes and perceived to belong to the same collective, reinforcing their recognition as members of the group. Following this argument, team heterogeneity may bring communication difficulties, conflicts, and may raise the salience of people social identities. Thus, team heterogeneity may be responsible of starting a range of interpersonal processes that could delay innovation and loss team effectiveness (Perreti and Giacomo, 2007). But homogeneity can be observed as restraining individuals' social world too, affecting information transmission and also other relations. Relations and course of material information will likely be within the network of similar persons, and diversity may enlarge the network of external contacts through which a team win approach useful resources. Teams with greater levels of contact between persons of the same tenure showed to be less effectiveness than teams with links between members who started work for the organization in different moments (Reagans and Zuckerman, 2001). Team members, who enjoyed different positions on the tenure distribution within the entity, may have different type of information, skills and experiences, and they usually do not cooperate much with each other but with other individuals who are of similar tenure. This argument has settled down that teams may promote contacts between scientists who are different in organizational tenure in order to obtain higher benefits for the group. Latter results reflected the orientation of a perspective on social capital which emphasizes the importance of interchanges between persons with a broad scope of information, experiences and abilities, to maximize the team's capability for creativity and effective behaviours. This way, members with higher experience and perspectives may increase the information available for problem solving, improve the group's capability to think about alternative interpretation, and increase the ability of the team to produce effective or creative solutions to problems. As a consequence, team heterogeneity may give cognitive resources and social capital that can boost team performance.

Other studies argue that homogeneous teams are expected to achieve higher performance because they have higher degree of network density. Network density is the standard strength of the relationship between team components, and it is minimum when no relationships exist between team members and maximum when all team members are connected by strong relationships. Network density allows team members to identify between them and as a consequence, facilitates mutual coordination. Increases in network density will then indicate the superior capacity for a team to coordinate its activities, increasing their performance. In fact, R&D teams that have more dense networks of interaction reach a higher degree of productivity than teams with more spare networks (Reagans and Zuckerman, 2001). Better communication links among members of a group enable them to reach a greater degree of coordination and a level of productivity that is unachievable for teams that are not so well connected. Homogeneous groups are thus expected to perform higher because they may coordinate their actions more easily than diverse teams (Reagans and Zuckerman, 2001).

But we have seen that individuals who extend ties with disconnected groups may achieve access to a broader array of ideas and opportunities than those who stay limited to a single one (Granovetter 1973). A second network-based approach to social capital has appeared on the premises that teams characterized by high network heterogeneity (relationships on the team outside demographic boundaries), benefit from higher learning capability. This alternative argument establishes that having a diverse membership really improves a team's performance. Although homogeneous groups may be more agreeable, their performance is constrained by the duplicity of their members' perspectives, information, and resources (Reagans and Zuckerman, 2001). If bigger demographic diversity entails relations among people who have dissimilar sets of contacts, skills, experiences, etc. then heterogeneous teams may enjoy higher capability for creative action.

Diversity is then a key variable to understand the knowledge base of research teams and organizations. De Saá Pérez, Aguilar Díaz, Díaz Díaz and Ballesteros Rodríguez (2012), in their works about diversity of R&D work teams and its impact on scientific productivity, sustained that human capital of work teams (function, gender, educational, institutional affiliation and status) increases scientific production. Teams with a variety of knowledge, experiences and abilities among their members, improve their absorption capacity to exploit external and internal knowledge though interactions and learning. Therefore, it is reasonable to think that diversity also may contribute to innovative behaviours. Group heterogeneity obtained bigger performance since the higher the distribution of functions between team members the higher was the distributions of tasks. But these positive relationships decreased when diversity was associated to educational background and to the participation of researchers coming from other R&D institutions. Empirical results showed that certain sum of diversity increased R&D groups' performance within universities in terms of amount of published scientific articles. These factors can help organizations, R&D managers and researchers to design the optimum composition of their research work teams, but little study has been developed to measure the impact of diversity in the results and performance of research teams when applying for competitive funded projects.

Chapter 4

Hypotheses development

4.1. OBJECTIVES OF THE STUDY

The capacity to raise competitive funds has been proved a key issue for guaranteeing the existence of most R&D public organizations and the future of the current public welfare systems implemented in most countries. Due to the restriction of available national resources for conducting R&D activities, there is a growing need and consequent competition between countries and researchers to obtain external funds. Further, under this competitive environment, research groups of public non-profit entities need to obtain funding through international competitive programmes in order to guarantee their organizational activities and R&D projects, being their capacity for gaining funds in a competitive basis a key factor for the group and their organizations endurance.

Some factors within R&D public centres may influence researchers' successful competitive funds acquisition. Their knowledge is a relevant issue for public national R&D systems too, who may benefit from this domain, improving the opportunities of obtaining resources among these types of funds. Even though literature has shown the importance of the different international current funding programmes (European Commission, 2014; Galsworthy and McKee, 2013; Grimpe, 2012), little research seems developed in the analysis of the factors that impact researchers' ability to acquire competitive funds.

Although efficacy of work groups has been extensively studied in literature (Choi et al. 2003; Lin et al. 2005), there is not much research focused in R&D groups' efficacy regarding effective international competitive funds acquisition performance within R&D public organizations. In fact, as far as it has been reviewed in recent studies, little research has been undertaken considering which factors determine international funds acquisition success within R&D public institutions, being this study a key issue for improving national and regional science systems sustainability in our opinion.

At present, we have done a large and novel exploratory work to study the general factors that may influence efficacy in relation to funding acquisition success rates, considering the different players in R&D organisations: Directors/CEOs or TMT, Project Management Offices, and R&D work teams. In addition, we have explored the potential impact of groups' composition and the relationships and process existing among them, as well as other general factors on work groups' efficacy like incentives and motivations, networks establishment, collaborative practices, collective behaviours, perceived support, etc.

Once an extensive review of literature has been done and the exploratory analysis of the general factor completed, according to the professional experience of part of the study team, as Head of a Project Management Office at a public R&D centre, and the qualitative data collected from personal interviews agreed with different actor at numerous R&D centres of the sample, we are going to focus our attention on the relevant players who are most important or influential in the efficacy of these centres or in their success in international competitive projects gained. Thus, focusing our analysis in the key actors for international project application process and funds acquisition success within R&D public institutions, in the field of Health Sciences, we will analyse the role of the R&D work groups or scientific research areas and the project management offices. The research will be set not just at high management level, but in the hierarchical level of work teams, who have their supervisors or coordinators (Principal Investigator for R&D teams and/or Heads of Areas). In addition, structures or departments for supporting research work teams activities, like the Research Management Offices or sponsored project departments within R&D centres, will be studied thoroughly too. Therefore, we will analyse how these departments may influence and foster –assist, help and motivate– performance regarding international funded projects acquisition.

The qualitative analysis already developed has led us to inquiry about the roles of the Heads of R&D Areas and their research teams and about research manager offices, as the actors who most may influence research institutions competitive projects application and efficacy of their centres, attending the priorities of the R&D areas, the incentives influence, and the amount and type of activities developed by the supporting departments. The study will analyse how this variables and structures affect the organization performance, meaning the competitive advantage that provides to get larger international funded project (more resources, improved economic performance, etc.). Other organizational structures, like the CEO or Director of the R&D centre, will not be considered a key actor in our research model, since they may support R&D groups and managerial structures (Clausen et al. 2012; Kennedy et al. 2009; Sirmon et al. 2011) but they do not significantly influence the application of competitive funded projects by the research groups, thus the potential research teams' performance on this scope of activities.

The analysis of the factors that influence the success in obtaining funds within public institutions (proactivity and efficacy) may allow R&D centres to improve both the general strategy and the research groups' one, in order for them to efficiently assign their limited resources and be more successful in competitive funds acquisition. Moreover, knowing that Spain is not a successful country in terms of R&D outcomes and transfer of technology performance, in comparison with other European countries innovation ratios (European Commission, 2014; Informe COTEC, 2014), we conduct the study among Spanish public non-profit organizations to enlarge the knowledge of this disadvantaged trend. The results of our study may also be applicable to other countries with similar patterns; and will provide institutions, R&D

groups and Research Management Offices with a close analysis of the factors which may increase their outcomes in international funding programmes, and to apply the corrective measures to achieve higher competiveness.

4.2. MODEL AND JUSTIFICATION OF RESEARCH QUESTIONS

Chapters two and three of this thesis have described, according to literature, diverse factors, attributes and characteristics about competitive sponsored projects and about R&D teams, which may influence their successful performance during projects achievement processes. When applying for international competitive granted projects, some characteristics of R&D work teams and research management offices may have an important impact on their outcomes, together with the efficacy of the group and the quality of their works. In particular, chapter three has focused on the analysis of diverse internal factor that may affect R&D teams' performance within research institutions. In addition, reviewing literature about work groups' efficacy, the study highlighted the importance of implementing efficient processes for a proper performance in organizations, which also may apply to R&D institutions.

We have seen that with limited nationally funds for R&D activities, and under a highly competitive environment, research groups need to get external funds through the available competitive programmes, in order to achieve proper results and to guarantee their operations and functioning activities (Bazeley, 1998). In the specific framework of our study, this capacity for obtaining competitive external resources will be associated to the number of projects applied by the R&D groups to the main European funding programmes. The more projects R&D groups may apply for, the higher amount of funds will be able to get from these agencies. Further, the more quantity of project proposals researchers may apply for, the better will be the proposals, due to the learning process from evaluation feedback, and the wider experience acquired and better knowledge of topics and programmes.

Researchers improve and learn through the application of competitive projects. Indeed, research staff who applies for projects to international competitive calls will be more effective than those who never apply for this kind of funding. First, R&D teams will have more possibilities to obtain funds only if they apply for projects. Secondly, researchers who apply for projects to international agencies in a regular basis will be able to improve their proposals incorporating recommendations provided by reviewers and evaluators, thus writing better proposals. They will also improve the knowledge of this type of funding processes, increasing their chances to gain those calls. Then, proactive researchers will be more effective or successful than less proactive R&D team members. But over time, researchers who are not successful in acquiring competitive funds will cease to apply for projects, due to the possible discourage produced by the repeated proposal rejections. In our study, proactivity will be then a variable associated to the efficacy of the centres.

As mentioned in previous chapters, the variable proactivity of R&D teams will be assessed by the amount of international competitive projects applied by research staff, considering both the number of projects granted and the economic amount of competitive funds requested to diverse international agencies and different funding programmes by each centre. In addition, the variable effectiveness or productivity of the centre will be measured by the quantity of international projects gained by the institutions, both in number of projects acquired and the global economic amount of competitive funding obtained by each centre. Since there may be a direct and positive relationship between the proactivity of the R&D groups (international projects applied) and the efficacy of the centre (international funded projects gained), we hypothesise:

H1: The proactivity of R&D groups is positively related to the efficacy of the centre in terms of success in international competitive projects gained.

4.2.1. Research & Development Work Groups

The last mission of R&D institutions and public universities is to help for the economic development of society, apart from their teaching and research activities. Universities and R&D centres need to become more effective and competitive organizations, according to the current public innovation demands, and also they have to face new challenges to look for external funding sources in order to support their main activities. Nowadays external sources may be usually acquire in a competitive basis, and have to be implemented by research groups through consortium agreements with industry and other research partners.

The analysis of the science and technology systems clearly indicates that research groups constitute the basic element on which the execution of research activities in the public system of all developed countries is structured. Indeed, research groups are identified as the basic units of scientific research organizations, technological development and innovation within R&D institutions. Above them, the national public institutions set other organizations with higher level of complexity, such as the universities or the R&D centres. Research groups are the ones that, with its prestige and continuously performance over time, revalue the role and the quality of their different activities in R&D institutions (university, public research organization, etc. in the Spanish case), and enhance the technological innovation and technology transfer activities to productive sectors (UPM, 2013).

In recent years, public administrations have promoted R&D activities through the creation and strengthening of their own research groups (UPM, 2013). The way in which this process takes place is highly variable and dependent on the context conditions in which the research activities are developed, which depends in turn, on the structure and resources of the research groups and of the R&D centre where they may carry out their works.

The concept of research group or team is here referred to a set of R&D tasks that involve interaction between individuals, in order to get that a multi-individual unit will function as a group. Starting our analysis of the main variables may influence the efficacy or R&D work teams, group productivity is a key factor. Group productivity may be measured by the number of patents presented, number of scientific publications in JCR, but also by the number of funded projects the group has gained applying to competitive national and international calls. For our study, team productivity or efficacy will be linked to the number of international competitive projects the R&D groups within their centres have won during the last years.

Efficacy perceptions refer to group members' beliefs in terms of their capacity to success in task performance, and usually indicate that higher levels of efficacy lead to high performance in organizations. Efficacy may affect the processes by which work groups make their decisions, and the success of crucial decisions is influenced by the processes managers use to make them, like the selection process of competitive research calls to apply for at R&D institutions. Many of the decision processes that characterize effective group decision-making may be influenced by perceptions of collective efficacy (Tasa and Whyte, 2005).

According to literature of groups performance, the groups benefit from work-related group centrality, which suggests that when groups face tasks that need effective and efficient coordination, it may be more beneficial to have some degree of hierarchy within the group, and that the group level, whether or not centrality helps group performance, may depend on it being work related (Lin et al. 2005). Further, vigilant problem solving also influences the relationship between collective efficacy and decision outcomes. Moderate levels of collective efficacy have been confirmed to be more conducive to problems solving than either low or high levels of collective efficacy. Collective efficacy has been proved to influence the way important group choices are made. As levels of collective efficacy exceed relatively moderate levels, reliance on vigilant problem solving begins to decline. Thus, high levels of efficacy may also lead to outcomes such as growing commitment to a losing course of action and strategic diligence (Tasa and Whyte, 2005).

For R&D groups, understanding formal practices in the commercialization process of university technologies has already been studied, attending to the agents who are involved in the decision making processes from the disclosure of the scientific discovery, the decision principles used and the alternative ways of exploitation (Kamariah, Wan Zaidi and Izaidin, 2011). Universities and R&D entities vary their practices about what to patent and the routes of exploitation. In fact, most of them based their selection norms on motivations of the inventors. Due to the importance of this factor, from the competitive R&D projects perspective, who participate in the selection of appropriate competitive calls (if anybody of the group members), who support the application process within the R&D teams, who priories and establish further developments of the project results from this early stage of the technology, etc. should be studied.

R&D work groups' use to be supervised or coordinated by a responsible person (Director or Heads of R&D Area) or principal investigators (PI) of a specific research line. The PI, as research team leaders, may influence individual members' growth and achievement by allowing them to share their ideas and experiences (Choi et al. 2003). In particular, supportive leader behaviour and positive perceptions of the leader may be good for creating a favourable group environment to individual development. Leader influences on team members are open stimuli that may influence member specific perceptions and lead to distinct outcomes for each member, thus increasing the overall performance of the group. In fact, the leader is a coordinator and facilitator who decentralize authority, and provide information and communication to the group. But all members shall share the leadership within teams, each one assuming his/her own personal responsibility as changing agents, being the successes or failures a result of the team actions as a whole.

In addition, effective leadership in work teams is a function of the leaders' place in the organization, their tasks, their personality traits and the others' and their acceptance and dependence of the group. Effective leader joins the team as a member, articulates a vision, creates a clear mission and develops goals, objectives and plans. The leader has ability to involve team members, ensures compliance with short-term tasks and convenient task assignment, he/she is able to inspire the desire to produce high quality products and services, is a good communication and listening person, conflict resolution and consensus building within and outside the group, is able to create an open environment where members freely express their views and opinions, and do not disapproves those who take risks and promote innovation (Choi et al. 2003).

In this context, the leaders of the diverse R&D groups in a research centre –the PI or Head of R&D Areas or research teams responsible– will establish the scope of activities to be developed by their groups for a certain period of time, and the short and long-term priorities of the area. The Head of the R&D Areas will decide which activities will be prior to others, and in which tasks the group will focus the daily efforts and (most of times) limited resources. The application and acquisition of national and international competitive funds may be one of the diverse activities undertaken by the research groups. The proactivity and the efficacy of the teams –to get higher funds via competitive projects– measured in our study in terms of international competitive projects gained, may be or not a priority for them. This may depend on the importance and promotion given to these actions by the Head of the Area in comparison to the rest of potential or current activities developed by his/her group/s, the annual goals to be achieved, the scientific policy follow by the centre, and the annual budget for R&D actions, among many others. Thus, to know which activities are the most important –the main priorities established and promoted by the group Area Director–, will give us crucial information about the consideration researchers are giving to this objective and the influence this precedence may have on the overall proactivity and efficacy of the centres.

Despite all the factors previously analysed which may affect research and development work groups effectiveness, in the scope of our study on R&D work groups efficacy in Spanish public research institutions, we observed common structural and operational problems affecting most of the entities of our sample, who tended to show similar research structures and patterns in the application of their R&D policies. During the primary data collection process, where respondents were asked to fulfil specific survey questionnaires, a significant amount of personal interviews were arranged and additional qualitative data was obtained from the different key actors regarding their R&D structures. We also collected valuable information about their internal research practices.

In Spain, large public research institutes are under the responsibility of the State, while the rest are regional and local institutions and hospitals under the responsibility of Regions. The central state has exclusive powers on the general framework for R&D policies and governance problems have emerged, since there is a combination of lack of autonomy and lack of managerial responsibility and empowerment in the management of public research institutions (European Commission, 2014). These shortcomings concern to the public institutes in global and to their current units and laboratories. The lack of autonomy is also related to the administrative division of labour between the central administration and Autonomous Communities.

The lack of flexibility and an inadequate incentives policy in the public research system has been also a problem. Public research organizations are part of the public sector and its employees are subject to general civil servant rules: this causes inflexibility in their management and human resources policy. The system gives little empowerment or autonomy to research leaders (Principal Investigators) at Area or institutional level, thus interfering with its change into new directions and the creation of research departments with a critical mass, high-quality productivity and an entrepreneurial character. Research Directors of these entities lack empowerment in terms of strategic planning of human resources. The severe budget cuts, which have resulted in suspensions in employing new personnel, have added inflexibility to the system. The weak incentives for research performance entails a lack of institutional support and collective recognition in terms of promotion, reputation and that inhibits the creation of open environments for R&D and innovation. Hence public research organizations management as well as individual researchers lack incentives to enter into such cooperation.

Following previous arguments, we observed a human resources constraint in the public research system, due to the budgetary situation that has resulted in the drastic reduction of the prospects of securing a position for a generation of early career researchers, added to the problem of the ageing profile at research organisations. In addition, the insufficient incentives system in the public research sector has consequences for the weak mobility of researchers, which is another element of its lack of flexibility.

Due to the fact the Spanish public system is highly restrictive and constrained for public research organizations, most of the centres analysed showed similar patterns for implementing their almost non-existent incentives policy, for group composition processes, for research staff recruitment, with few possibilities for contracting excellent researchers or star scientists, etc. Indeed, with a restrictive public system for most of the research institutions, we found a model of centres analogous to each other (similar recruitment of staff, composition of R&D and management groups, incentive system, teams structure, etc.), with little room to manoeuvre staff contracts and motivate their personnel. Most of the centres of the sample showed similar patrons, with similar work teams and most structured in the same way, not being possible for us to deal with clear differentiated structures.

With similar structures in public R&D centres, annual priorities established by the Area in regard to the development of research activities by their groups, meaning the intentionality of the research staff to achieve certain R&D activities, will be a crucial issue to study, in order to really know how they perform and in which terms centres may differ from the others. To analyse the proactivity of R&D work groups within the centres, we will then not pay attention to the characteristics of the R&D teams, which have turned out to be similar because the many constrains and limitations they face within the public research system, and with no options to discretionarily, but in the intentions to undertake R&D challenges and develop activities. Thus, the approach the Heads of the R&D Areas may give to these actions –the intentionality of the centres– will be the main factor for evaluating the proactivity of the R&D work groups and the departments' priorities will be the elements on which we can establish our hypotheses.

If the priorities settled by the Head of the R&D Area are not clear or seem dispersed, if there is not a priorization of the actions to develop by the teams in their annual work plans, the groups will be unable to focus their attention and efforts in competitive project applications, since they will have to attend a large number of imperative activities at the same time. Therefore the amount of requests for projects will be lower and the proposals submitted will have lower quality. If the group has less time to prepare international proposals with the required excellence standards and to do appropriate networking, the possibility of making mistakes will increase and the efficacy of the centre will be reduced. Consequently, we pose the following hypotheses:

H2a: A dispersed or unclear variety of priorities of the Heads of R&D Areas will decrease the proactivity of the R&D groups in asking for international competitive funds.

H2b: A dispersed or unclear variety of priorities of the Heads of R&D Areas will decrease the efficacy of the centre in the acquisition of international competitive funds.

4.2.2. Research Management Staff

Macho-Stadler, Pérez-Castrillo and Veugelers (2007) developed a theoretical model to explain the specific role of TTOs in licensing university inventions. A specific transfer unit allows for specialization in support services, like partner searching, management of intellectual property rights and business development, among others. TTO may be able to benefit from its capacity to boots innovations across research areas and to build high reputation within universities (Macho-Stadler et al. 2007). They explained that there is a critical size for the TTO to be successful. TTOs usually work as separate Units within R&D institutions, but the staff at the TTO need to maintain close relationships with researchers at the different R&D areas. Thus, R&D centres shall adopt the appropriate institutional incentive mechanisms to ensure researchers to produce inventions and pass them to the TTO staff (Macho-Stadler et al. 2007).

Understanding of knowledge transfer within organizations and the potential benefits of corporate innovation strategies, willing to increase employee participation in knowledge transfer and innovation, has been already analysed. Previous studies have evaluated the way extrinsic and intrinsic motivations might explain the way employees are better connected in the organizational knowledge transfer network or might be engaged more in inter-unit knowledge transfer (Aalbers et al. 2013).

Motivation to be involved in knowledge transfer activities (like the ones developed in a research management office) is different from motivation to position oneself positively in the network in which innovative knowledge is transferred. But overall connectedness and internal unit ties in a knowledge transfer network may be beneficial, being individual motivation the first cause for knowledge transfer. Since effective transfer of knowledge between employees within an organization increases the creativity and innovativeness of that institution, organizations can try to influence individual actions to help to achieve favourable outcomes for the whole entity. Such orchestration may start with an understanding of what motivates the individual to transfer knowledge, as well as with whom individuals exchange knowledge (Aalbers et al. 2013).

The bigger perceived uncertainty and costs concerned in internal unit knowledge transfer point out why internal unit knowledge transfer may be associated to individual's extrinsic motivation, and the effect of individual's intrinsic or extrinsic motives on connectedness in the global network remains unclear. According to literature, and with respect to the TTOs and other staff directly responsible for transfer of technology issues, decisions regarding organizational design shall be accompanied by suitable recruitment and reward policies, meaning the design of incentives for TTOs personnel in order for them to achieve their duties and formal works (Siegel and Phan, 2005). Preliminary research indicates that incentives are important because TTO work teams and linked stakeholders act as dual agents for the R&D entity and research members. Pay for effort or pay for results can be possible, but suitable compensation systems balance the mix of both types in order to boost the appropriate efforts. Institutional incentives and organizational practices have been seen to play an important role in enhancing the effectiveness of technology transfer in R&D institutions, (Siegel and Phan, 2005).

Concerning the establishment of R&D projects, partners often do not have previous collaboration experience on which they could set their prospect and predictions. Additionally, the lack of time and long-term permanence perspectives makes difficult for project partners to develop familiarity and to prove each other's support and capability. The formation of trust may be an important but challenging task, and it shall be achieved by both considering project team composition and project rewards design. For collaborative projects like the European Framework Programme ones, knowledge sharing between project team members is needed for projects performance, but literature about networks has proved that knowledge sharing is still challenging. In temporally projects like those ones, such teams are provisional associations that may not progress through the necessary team formation cycle, and are usually expected to create intangible results in a limited period of time (3 to 5 years). But literature results exposed that organizations can boost trust establishment by setting clear objectives and measurable project rewards, and by choosing a staff approach that allows for already familiar team members, long-standing team composition and permanent team membership (Maurer, 2010). Thus, for competitive project applications and funds acquisition, meant a measure of team performance, we could expect that permanent contracts (job stability) and rewards designed by project gained may increase trust among team members, thus increasing their performance in projects achievement.

Research has shown that career paths for university technology licensing officers are limited and often of insufficient periods, which implies that incentives should be aimed at creating immediate feedback and rewards to draw the desired behaviours. Appropriate incentives must also be designed for faculty members or researchers, since they are the inventors, the main contribution in technology transfer. Rewards policy and incentives should be solved at the highest levels of the organization (CEO/ TMT decision), because it should be within the top-level priorities agenda. Following this argument, further study to enlarge previous results should be done, beyond motivations of people within R&D entities to enrol in business or transfer of technology activities. Moreover, although the proven importance of reward policies for increasing performance and outcomes in research organizations like TT activities, there are not enough studies about rewards and motivations associated with international competitive projects applications and achievements for R&D teams within research organizations.

The following hypotheses arise:

H3a: Incentives to Research Management Offices influence the proactivity of the centre or the success in international competitive funds applications.

H3b: Incentives to Research Management Offices influence the efficacy of the centre of the centre or the success in international competitive projects gained by R&D groups.

One of the main challenges national governments have faced in their efforts to sustain innovation activity in companies is easing the process of technology transfer from R&D institutions to businesses. Scholars and policy makers recognize that cooperation partnership between industry and the public research institutions is a need for innovation and national economic growth. Over the last years, universities and R&D institutions have made firm advancement to foster the process of technology transfer through collaboration with industry, and to establish TTOs has become habitual practice for supporting the commercialization of academic research. Literature shows that there are many factors that affect the efficiency and effectiveness of these offices (Muscio, 2010). From the universities' and research centres perspective, the applicability of research to industry, and collaborations with private firms has gained bigger strategic significance in terms of their potential as sources of funding. The authority and management of these interactions influences both their frequency and their success. Many universities and R&D entities have set up TTOs to motive scientists to take into account commercialization, and to support them through all this process.

Research management staff is referred in this study both to work teams within the TTOs of R&D institutions and/or to work teams within Project Management Offices, depending on the size of the entity (university, research centres, high-tech firms, technological institutes, etc.), its structure and the field of their research activities. Many participants such as academic researchers, TTOs and private industry may be involved in technology transfer activities which have been demanding a broad approach of study. From those players, TTOs are considered to be key stakeholders to determine a university's overall success at this particular business process (Anderson, Daim and Lavoie, 2007). Besides, improving university technology transfer performance in Europe has been attracting much attention among policymakers, as revealed the large amount of policy initiatives in this field developed during the last decades.

Although operating in the same research fields, R&D centres have their own functional characteristics and their specific research objectives, being quite different ones from the others. Accordingly, there may not be a unique model of research management office or TTO for assisting the entirely organization project management requirements in the same way. Despite this, previous studies have shown that work teams allocate some common features, which make them work efficacy, thus obtaining higher performance and better outcomes for their organizations. Following this idea, and the concepts highlighted in the reviewed literature about work teams' efficacy, some common general characteristics for R&D research management staff (as work teams) in R&D centres could be established, in order for them to best achieve performance and quality support when assisting researchers in getting and managing international sponsored projects.

We have seen that work teams within R&D centres are dynamic units, self-administrated, with clear objective. In general terms, some of the main characteristics of effective work teams are described as follows:

- They need to share a common clear objective, aligned with the organization goals. In the case of R&D research management staff, we may focus in the achievement of competitive funds via international sponsored projects.

- They shall understand the team roles and the team structure of the management office. The roles of the team members shall be understood by all of them, and staff shall be clear about what is expected from each other and the role of other team members.
- Excellent performance. The achieved R&D management outcomes shall provide value results to the organization, and each member may help each other to overcome obstacles.
- Effective use of diversity. The work team may have a balanced composition of genres, cultures, ages, experiences, etc. Persons with a wide range of skills, knowledge and attitudes may compose the team. No predominant style of work is priori recommended and diversity is used for the team and the entity benefits.
- Problem solving and decision-making. The team tries to make acceptable decisions towards most of its members, differences in opinion are discussed openly and in most cases decisions are taken by consensus. The team staff within the management office may have enough variety of approaches, skills and knowledge to ensure the best decision.
- External relations. The team shall spend some time developing important relationships, mobilizing resources and building credibility with key stakeholders in other areas of the organization. This relations can be of two types: with other groups within the centre, like the research groups or different researchers, and also with other groups from outside the centre, like international funding agencies, public R&D entities, other national/ international research management offices, etc. The team staff shall have a number of procedures to facilitate their relationships with other teams.
- Self-assessment. Periodically team members shall review their performance and what could be interfering with their effectiveness. Thus, team members shall reflect the achievements with open and honest processes. Team members may listen to the views of all and consider each contribution seriously.

A better understanding of technology transfer in academic and R&D institutions has been made investigating the role of policies on performance (Caldera and Debandeb, 2010). The effectiveness of university research commercialization may be affected by an amount of different factors. Several studies have shown that technology transfer performance is influenced by university characteristics including university ownership (public versus private), academic quality, local high-tech demand circumstances, license contract design and the features of the TTO. Further, empirical results suggest that universities and research centres with established policies and procedures for the management of technology transfer may perform better. Universities with large and experienced TTOs produce higher volumes of contract research. Additionally, granting a higher share of licensing royalties to the inventor stimulates licensing activities. This suggests that designing the accurate incentives and sharing the risk optimally between parties involved in the research valorisation is an important component of an efficient technology transfer strategy.

Technology transfer activities should be considered from a strategic perspective, since these activities lead to substantial financial gains for the institutions and bring other non-monetary benefits. As a result, many research institutions are seeking methods to maximize the efficiency of TTOs. A strategic approach to technology transfer implies that such initiatives should be driven by long-term achievements, provided with sufficient resources to raise these objectives, and make performance monitoring. According to literature, institutional incentives and organizational practices have played a significant role in increasing the effectiveness of technology transfer. But few studies have analysed the relation of universities and R&D centres project management offices (ex-ante activities to transfer of technology) with industry, and their efficiency in terms of increasing funding from collaborative competitive projects.

When dealing with competitive research project management results, not so many studies have been done in order to improve the efficiency of this structures and to better measure their effectiveness. The efficiency in the service of transferring research results into other sectors may vary depending on the leadership level of the universities or R&D institutions, if they are public or private, and also those with medical schools or without, among other factors. But following Caldera and Debandeb (2010) argumentations, additional characteristics of TTO staff could be examined, like the number of people work in the TTO, the impact of different intellectual property policies and faculty incentive systems, etc. Also to find the most product scale size and defining if there is a practical size for successful TTO.

TTO managers may need the support of the R&D and other departments to be effective. R&D centres and university's research performance affects scientists' employment of TTOs, since research performance drives academic use of TTOs and consequently affects the licensing out process. Indeed, those departments with good research production are more often expected to get in touch with TTOs to transfer their results, and companies are more likely to make contacts with the TTOs located in universities or R&D centres with a good research position, in order to access to their outcomes and technologies. Nevertheless, most universities and research centres manage their own TT activities, but few have sufficiently strong research bases to let the establishment of high-quality offices (Muscio, 2010). Managing a TTO require special skills to ease the matching of academic knowledge, competencies and resources to business needs, and give support in the commercialization of technology (Muscio, 2010). The participation of professional, non-academic managers in TTOs will support these activities and bridge the cultural break between university and industry.

Previous qualitative research evidenced that information flows between researchers and the TTO could be improved (Siegel and Phan, 2005). Studies have shown that universities make larger use of TTOs when non-academic managers conduct them. This may clarify why some TTOs are more effective than others in managing university intellectual property. Moreover, it has been seen the importance of innovation and expected impact in European competitive funded projects success, meaning that professional staff with adequate professional profiles may be needed when applying for these funds and for developing this tasks along the project. Additionally, TTO research management employees may be involved in reducing the critical asymmetry of information problem classically found in the scientific knowledge market, improving communication between the different agents and rising the transfer of technology success. Indeed, to understand how research management groups coordinate their office activities and which relationship maintains with their research groups in a dairy basis is also important. Thus, which factor of research management offices may influence R&D groups for them to increase the amount of international requested projects and the resources gained by competitive funds acquisition, can be studied by the number of people work at the TTO in order to guarantee a proper service to researchers, but also by the workload of the TTO, meaning which are their roles and functions for assisting research groups in the best possible way, which processes –amount of services provided, nature, professionalized degree, client oriented– may have been established to effectively work for the research groups. Given the above, two new research questions arise:

H4a: Workload of Research Management Offices influences the proactivity of the centre or the success in international competitive funds applications.

H4b: Workload of Research Management Offices influences the efficacy of the centre or the success in international competitive projects gained.

4.2.3. Control Variables

Attending to R&D work teams' efficacy, research on teams has shown that innovation depends on organizational and environmental determinants, but also on team composition and related team-level processes (Perreti and Giacomo, 2007). Literature analysed the introduction of newcomers in work groups and how combinations of newcomers and old-timers in teams bring positive relationships with innovation. According to previous studies, while incomers enhance exploration, innovation, and the probability of finding more creative solutions to team problems, old-timers increase exploitation, inertial behaviour, and resistance to new solutions. New configurations of team members are key sources of innovation. Indeed, the merge of organizational learning and organizational demography literature has proved that innovation come from both newcomers and the novel combination of old-timers. These relations could also be applied not just to innovation, but to other results close to the innovation process and coming from R&D teams, like scientific project success.

We have already seen that one of the main demographic variables in R&D work groups is their composition, since groups may consist of members who bring diversity to them, likely integrated by individuals who differ in personality, attitudes, skills and abilities that may also influence their performance (Lin et al. 2005). Work team members' personality may promote cooperation or conflict, influencing decisions and outcomes. The type of task will determine the group composition and the group size shall influence teams' outcomes too, since context significantly affects the effectiveness of the group, and the optimum size will depend on the tasks nature to develop.

Additionally, previous studies have presented models of classic projects on health and biomedical research field (like pharmaceutical research projects), where Principal Investigators often tend to allocate more scientists to a project than the most efficient amount in terms of progress per scientist-year (Gittins, 1997). The number of researchers that should be participating in a project at each stage is important for R&D groups when the institution pursues profitability. Key challenges in R&D institutions comprise difficulty with time management and prioritizing, restricted resources, and contacts. Moreover, supportive work environment with an elevated level of individual autonomy lead to creative and prolific work environments (Carroll, ldab, Farahani, Lithner, Neumann, Sandhu and Shepherd, 2010). But the amount of researchers participating in R&D projects may also depend on the number of researchers who integrate the groups, meaning the size of the R&D teams and, by extension, the total of research lines the institutions cover in their specific field of study. The dimension of the research centres will be considered in the study.

The size of the research centres, the size of the research groups and the number of researchers who integrate R&D groups within these entities is an important variable to consider in our study since the number of researchers may determine the amount of projects and activities the entity is able to develop. More research staff work in a centre, more R&D activities could be undertaken and the amount of potential R&D projects in development will be bigger. Considering the application for competitive funded projects in the international arena, the size of the centre will be important due to the fact a large number of research groups with large quantity of members may imply more opportunities to apply and gain competitive funds, and the possibility for the Principal Investigators and Head of the R&D Areas to allocate more human resources to acquire international competitive projects. Therefore:

The number of research staff in the centre influences the proactivity of the centre or the success in international competitive funds applications.

The number of researchers in the centre influences the efficacy of the centre or the success in international competitive projects gained.

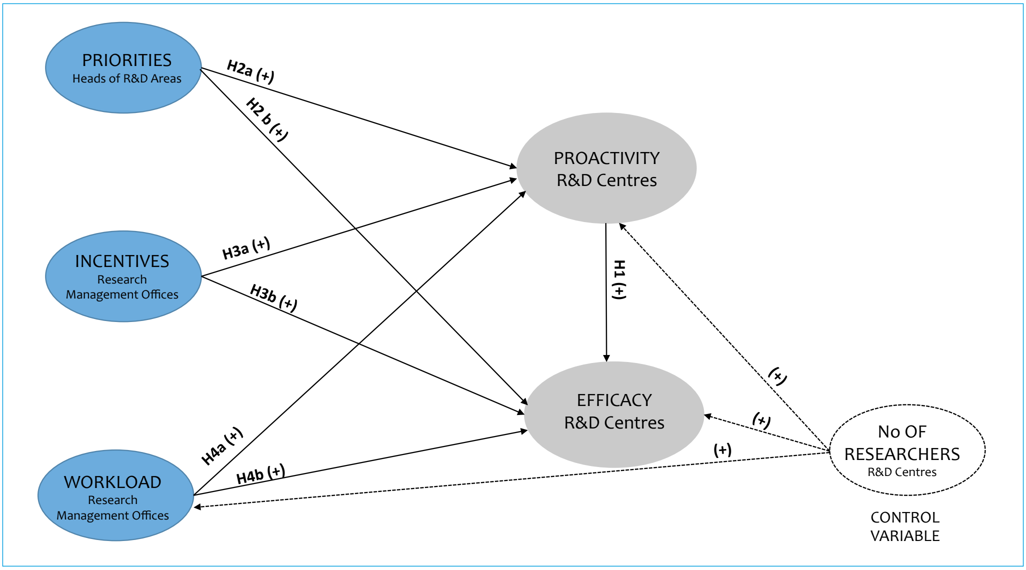
In addition, and from the research management offices perspective, the size of the research centres, the size of the research groups and the number of researchers within the R&D groups, with whom research management staff interacts, may be an important variable to consider too.

An increase of projects and R&D activities due to a large number of research staff may imply high amount of workload for projects managers, who will have to attend more demands and would technically justify a higher quantity of projects. Further, a large number of research groups with elevated number of members, may imply more complex relations between research management staff and the researchers, in order to achieve a quality service and an effective performance by this specialized offices. This will increase the quantity of task to be developed by the research management staff too. Given the above, we can formulate in the model:

The number of researchers in the centre influences the workload of the Research Management Offices.

According to the objectives of the study, a theoretical model is introduced to describe the different relations between the key actors who may influence R&D groups' performance, in terms of applying (proactivity) and getting international competitive sponsored projects (efficacy). For this purpose, 7 hypothesis have been established, which are justified below in this section. The research questions have been empirically tested and the analysis of measurement instruments, research model test and results are described in forthcoming chapters. The proposed model and its research questions hypothesized are represented in the following Figure 7.

Figure 7. Model of the Variables of the Study



Source: *Own elaboration*

Chapter 5

Methodology

This chapter develops the research setting, the method followed in the study and the contextual conditions for its framework. The target population and the identification of the sample are described in section 1. The following section explains the sources of information used in the study and the data collection process. Section 3 describes both the variables used in the dissertation and the statistical techniques applied to each research question.

As previously discussed, this research project is focused on the study of the relationship between the characteristics of research teams in R&D public Spanish centres and the success of obtaining international funds in the field of Health & Biomedicine. Teams' characteristics, such as its diversity, structure and behaviour, together with the interaction of research teams with the project management offices, may determine the success of obtaining international funds and, at the same time, it may affect the TMT and the CEO decisions about the distribution and reallocation of resources and research structures. In this sense, the research study aims to provide settings and parameters that could help to set the strategic management of these entities (proactive and entrepreneurial orientation, etc.), in order to increase the success of international competitive funding and to develop higher quality R&D activities. For this purpose, a model has been introduced to describe some relations that arise between the main groups of actors who may influence R&D groups' performance, in relation to the obtaining of international competitive funds. Further, 7 research questions have been established, which are empirically tested in this thesis.

5.1. TARGET POPULATION AND SAMPLE

The development of research capabilities has been identified as the most important drivers of change in the public sector research systems, their institutions and programmes. New activity programmes, like Information Technologies Systems (ICT), New Materials and Biotechnology, have been competing with traditional fields under high limitations on public spending, and demand the development of mechanisms to identify research priorities and to redistribute funds (Muñoz, 2007). Further, these sectors are featured by their horizontal character and by interdisciplinary research skills. Fields of research like Health and Biomedicine are of general interest to society since they contemplate the problem oriented nature of the research field, the collaborations between actors with different disciplinary and institutional backgrounds, as well as the emergence of 'new' productive configurations. In fact, some Life Sciences fields like Biotechnology and Biomedicine research have been given high priority since the early 1980s by both the European Union and its country members (Muñoz, 2007). The importance of Biotechnology research as a fast growing research area in government appropriations for research in recent years has coincided with important changes in national research policies. Research in Health Sciences is particularly interesting for studying the effects of public sector research policy because its institutionalisation and growth took place during the new regime for national research policies. Nevertheless, research in Biomedicine and Health is an area of central interest because it is frequently used as illustration of the new form of knowledge production and promises to give way to interesting results with a high relevance for research policy. We therefore have focused on the fields of Biomedical and Health sciences in our study. Following these arguments, and the ones described in the theoretical framework of this paper, the target population chosen for the study have been Spanish R&D public centres which conduct their activities in the Life Sciences research field, in particular within the areas of Biomedicine and Health.

5.1.1. Identification of the Population

In order to identify the population we started using secondary sources of information, through data from public and private databases, scientific publications, annual memories and scientific activity reports, company annual reports, etc. Through the access to the available scientific reports of interest, we identified those Spanish centres that develop their R&D activities in Health and Biomedicine fields, which had participated in competitive funded projects from national and international programmes during the last 5 years. Other few European R&D centres were also identified through secondary data, focusing on their characteristics and in the results they had achieved in regards to Life Sciences sponsored projects. Contacting these few international centres has allowed the research study to compare the national structures with similar organizations in a European scope, with expertise and shown success in number of competitive sponsored projects.

The selection process started checking the list of projects, both granted and rejected, associated to R&D institutions who had applied to the *Instituto de Salud Carlos III* (Institute of Health Carlos III, ISCIII) Strategic Action in Health Programme 2011-2012 competitive calls. This data was published in its web portal. The ISCIII is the main Public Research Entity funding, managing and carrying out biomedical research in Spain. The ISCIII is also the entity responsible for managing Spain's Health Research and Development Strategy within the framework of the National R&D&I Plan. The strategic planning of the ISCIII is part of the National Strategy for Science and Technology and the National R&D&i Plan, and is subject to the guidelines established by the Joint Committee of representatives of the Spanish Ministry of Economy, Industry and Competitiveness and the Ministry of Health, Social Services and Equality.

From this search, 24 public research centres were identified. We compared these results with the 12 institutes who belong to the ISCIII listed in its Web site, and also with the 18 institutions that were accredited by the ISCIII by 2013, also listed in its Web site (ISCIII, 2013). It was observed that all accredited institutes by ISCIII had been granted by the ISCIII competitive call in 2011-2012. Some results of other national competitive calls, which promote the participation of Spanish entities in international R&D programmes, were consulted, like the *Eurociencia* Programme of the Spanish Ministry of Economy, Industry and Competitiveness from 2008 to 2011.

We also looked at those public R&D entities associated to the European Association of Public Health (EAPH, 2014). We continued searching by text and got the R&D centres and institutes who belong to the *Centro Superior de Investigaciones Científicas* (Spanish National Research Council, CSIC), which is the largest public institution dedicated to research in Spain and the third largest in Europe. It belongs to the Spanish Ministry of Economy, Industry and Competitiveness through the Secretary of State for Research, Development and Innovation (SGCTI), and its main objective is to develop and promote research that will help bring about scientific and technological progress. We selected all CSIC centres included in the scientific area of Biology and Biomedicine, and some included in the Food Science and Technology scientific Area (CSIC, 2015). 21 new centres were identified.

Following the target population selection, we considered the 9 *Centros de Investigación Biomédica en Red* (Biomedical Research Networking Centre, CIBER). The CIBER are formed through the association of research groups linked to the National Health System to help form the scientific basis of the programmes and policies of the National Health System in the priorities areas of the National R+D+I Plan. The purpose of creating and maintaining CIBER is to promote research excellence in biomedicine and health sciences conducted in the National Health System and in the system of science and technology. The importance of this goal for science, health and society as a whole requires the ISCIII to undertake the promotion and financial support of these CIBER (ISCIII, 2015).

We also searched for information on R&D specialized publications, like the *Directorio Español de Ciencia y Tecnología* (DIRECYT-2008) of the

Fundación Española para la Ciencia y la Tecnología (Spanish Foundation for Science and Technology, FECYT), and the ISCIII ranking of the top 10 Institutes of Health Research publication. The FECYT is a public foundation dependent on the MINECO whose mission is to drive forward science, technology and innovation, promote their integration and proximity to Society and respond to the needs of the Spanish Technology and Business System. We completed the population identification looking at the *Red de Entidades Gestoras de Investigación Clínica Hospitalaria y Biosanitaria*, REGIC, list of members and its associated institutions. REGIC is the first association of clinical research management companies created in Spain, at the request of professionals, in order to share experiences and create a space for interaction and training in the management of R&D&i care. As a whole, REGIC represents a large part of clinical research in the country and has representatives from almost all regions (REGIC, 2015).

Attending available international sources of information, we also searched in the Community Research and Development Information Service, CORDIS. It is the European Commission's primary public repository and portal to disseminate information on all EU-funded research projects and their results in the broadest sense. The website and repository includes all public information held by the Commission (project factsheets, publishable reports and deliverables), editorial content to support communication and exploitation (news, events, success stories, magazines, multilingual "results in brief" for the broader public) and comprehensive links to external sources such as open access publications and websites. CORDIS is managed by the Publications Office of the EU, on behalf of the European Commission›s research Directorates-General and Agencies. CORDIS contents dates back to the origin of the service in 1990 and the website has been online since 1994. For the population of interest, we explored 7th Framework Programme results for Spanish participants, both as associate partners and as project coordinators, in the areas of Medicine and Health (CORDIS, 2012). All Spanish entities found in this portal had been previously identified.

Table 3 shows both the different sources of information consulted to identify the population of the study, and the entities chosen during the selection process.

Table 3. Search and Selection Process of Spanish R&D Centres

SOURCES OF INFORMATION	CONSULTATION DATE	CENTRES SELECTED
R&D institutions who had applied to the Instituto de Salud Carlos III (Institute of Health Carlos III, ISCIII) Strategic Action in Health Programme 2011-2012 competitive calls. List of projects granted and rejected by centre	2012	**IDIBAPS.** INSTITUT D' INVESTIGACIONS BIOMÉDICAS AUGUST PI I SUNYER; **FIBAO.** FUNDACIÓN INV. BIOSANITARIA EN ANDALUCÍA ORIENTAL ALEJANDRO OTERO; **FIMIM.** FUNDACIÓN INSTITUTO MAR DE INVESTIGACIONES MÉDICAS; FUNDACIÓN INVESTIGACIÓN BIOMÉDICA HOSPITAL **PUERTA DE HIERRO; FFIS.** FUNDACIÓN PARA LA FORMACIÓN E INVESTIGACIÓN SANITARIAS DE LA REGIÓN DE MURCIA; **O+IKER.** FUNDACION VASCA DE INNOVACIÓN E INVESTIGACIÓN SANITARIAS; **IN.** INSTITUTO DE NEUROCIENCIAS; **IBIS.** INSTITUTO DE BIOMEDICINA DE SEVILLA; **IDIBELL.** INSTITUT D'INVESTIGACIÓ BIOMÉDICA DE BELLVITGE; **IR-HUVH.** INSTITUT DE RECERCA HOSPITAL UNIVERSITARI VALL D'HEBRON; **IGTP.** INSTITUT D'INVESTIGACIÓ EN CIÈNCIES DE LA SALUT GERMANS TRIAS I PUJOL; **IIS LA FE.** FUNDACIÓN PARA LA INVESTIGACIÓN DEL HOSPITAL UNIVERSITARIO LA FE; **IIS-PRINCESA.** INSTITUTO DE INVESTIGACIÓN SANITARIA HOSPITAL UNIVERSITARIO DE LA PRINCESA; **IISFJD.** INSTITUTO DE INVESTIGACIÓN SANITARIA FUNDACIÓN JIMÉNEZ DÍAZ; **i+12.** INSTITUTO DE INVESTIGACIÓN HOSPITAL 12 DE OCTUBRE; **IMIBIC.** INSTITUTO MAIMÓNIDES DE INVESTIGACIÓN BIOMÉDICA DE CÓRDOBA; **IIS BIODONOSTIA.** INSTITUTO DE INVESTIGACIÓN SANITARIA BIODONOSTIA; **IISGM.** INSTITUTO DE INVESTIGACIÓN SANITARIA GREGORIO MARAÑÓN; **IdISSC.** INSTITUTO DE INVESTIGACIÓN SANITARIA DEL HOSPITAL CLÍNICO SAN CARLOS; **IDIS.** INSTITUTO DE INVESTIGACIÓN SANITARIA DE SANTIAGO DE COMPOSTELA; **IDIPAZ.** INSTITUTO DE INVESTIGACIÓN SANITARIA HOSPITAL LA PAZ; **IRYCIS.** INSTITUTO RAMÓN Y CAJAL DE INVESTIGACIÓN SANITARIA; **IBB SANT PAU.** INSTITUTO DE INVESTIGACIÓN BIOMÉDICO SANT PAU; **INCLIVA.** INSTITUTO DE INVESTIGACIÓN SANITARIA FUNDACIÓN PARA LA INVESTIGACIÓN DEL HOSPITAL CLÍNICO DE VALENCIA
Centres of the ISCIII and Institutions accredited by the ISCIII	2013	**CNM.** CENTRO NACIONAL DE MICROBIOLOGÍA; **CNSA.** CENTRO NACIONAL DE SANIDAD AMBIENTAL; **CNMTrop.** CENTRO NACIONAL DE MEDICINA TROPICAL; **IIER.** INSTITUTO DE INVESTIGACIÓN DE ENFERMEDADES RARAS; **CNIO.** FUNDACIÓN CENTRO NACIONAL DE INVESTIGACIONES ONCOLÓGICAS CARLOS III; **CIEN.** FUNDACIÓN CENTRO DE INVESTIGACIÓN DE ENFERMEDADES NEUROLÓGICAS; **CNIC.** CENTRO NACIONAL DE INVESTIGACIÓN CARDIOVASCULAR CARLOS III; **CNE.** CENTRO NACIONAL DE EPIDEMIOLOGÍA; **INVESTEN.** UNIDAD DE INVESTIGACIÓN EN CUIDADOS DE SALUD; UNIDAD DE INVESTIGACIÓN EN **TELEMEDIC1NA Y E-SALUD**; UNIDAD FUNCIONAL DE INVESTIGACIÓN EN ENFERMEDADES CRÓNICAS; **AETS.** AGENCIA DE EVALUACIÓN DE TECNOLOGÍAS SANITARIAS
Public R&D entities associated to the European Association of Public Health (EAPH)	2014	**FISABIO-CSISP.** FUNDACIÓN PARA EL FOMENTO DE LA INVESTIGACIÓN SAM TARI A Y BIOMEDICA DE LA COMUNI IAT VALENCIANA- SALUD PÚBLICA
R&D centres and institutes who belong to the Centro Superior de Investigaciones Científicas (Spanish National Research Councilm CSIC)	2013	**CBMSO.** CENTRO DE BIOLOGÍA MOLECULAR SEVERO OCHOA; **CIB.** CENTRO DE INVESTIGACIONES BIOLÓGICAS; **INRIC.** INSTITUTO CAJAL; **IPBLN.** INSTITUTO DE PARASITOLOGÍA Y BIOMEDICINA LÓPEZ NEYRA; **CABD.** CENTRO ANDALUZ DE BIOLOGÍA DEL DESARROLLO; **IBMB.** INSTITUTO DE BIOLOGÍA MOLECULAR DE BARCELONA, **IIBB.** INSTITUTO DE INVESTIGACIONES BIOMÉDICAS DE BARCELONA; **IBV.** INSTITUTO DE BIOMEDICINA DE VALENCIA; **IBBTEC.** INSTITUTO DE BIOMEDICINA Y BIOTECNOLOGÍA DE CANTABRIA; **CABIMER.** CENTRO ANDALUZ DE BIOLOGÍA MOLECULAR Y MEDICINA REGENERATIVA; **CIC.** CENTRO DE INVESTIGACIÓN CARDIOVASCULAR; **CID.** CENTRO DE INVESTIGACIÓN Y DESARROLLO PASCUAL VILA; **CNB.** CENTRO NACIONAL DE BIOTECNOLOGÍA; **IBFG.** INSTITUTO DE BIOLOGÍA FUNCIONAL Y GENÓMICA; **IBMCC.** INSTITUTO DE BIOLOGÍA MOL. Y CEL. DEL CÁNCER DE SALAMANCA; **IBGM.** INSTITUTO DE BIOLOGÍA Y GENÉTICA MOLECULAR; **IIBM.** INSTITUTO DE INVESTIGACIONES BIOMÉDICAS ALBERO SOLS; **UBF.** UNIDAD DE BIOFÍSICA; **IG.** INSTITUTO DE LA GRASA; **ICTAN.** INSTITUTO DE CIENCIA Y TECNOLOGÍA DE AUMENTOS Y NUTRICIÓN; **CIAL.** INSTITUTO DE INVESTIGACIÓN EN CIENCIAS DE LA ALIMENTACIÓN

Table 3. Search and Selection Process of Spanish R&D Centres (cont.)

SOURCES OF INFORMATION	CONSULTATION DATE	CENTRES SELECTED
Centros de Investigación Biomédica en Red (Biomedical Research Networking Centre, CIBER)	2013	**CIBERER.** ENFERMEDADES RARAS; **CIBERESP.** EPIDEMIOLOGÍA Y SALUD PÚBLICA; **CIBERDEM.** DIABETES Y ENFERMEDADES METABÓLICAS ASOCIADAS; **CIBEROBN.** FFISIOPATOLOGÍA DE LA OBESIDAD Y NUTRICIÓN; **CIBEREHD.** ENFERMEDADES HEPÁTICAS Y DIGESTIVAS; **CIBERNED.** ENFERMEDADES NEURODEGENERATIVAS; **CIBERES.** ENFERMEDADES RESPIRATORIAS; **CIBERBBN.** BIOINGENIERÍA, BIOMATERIALES Y NANO MEDICINA; **CIBERSAM.** SALUD MENTAL
Directorio Español de Ciencia y Tecnología (DIRECYT-2008), Fundación Española para la Ciencia y la Tecnología (Spanish Foundation for Science and Technology, FECYT)	2012	**CREAL.** FUNDACIÓ CENTRE DE RECERCA EN EPIDEMIOLOGÍA AMBIENTAL; **CIBIR.** CENTRO DE INVESTIGACIÓN BIOMÉDICA LA RIOJA
Search at Google: "Biomedicine & Health Research centres in Spain"	2012	**IBI.** INSTITUTO DE INVESTIGACIÓN BIOMEDICA DE VIGO; **CIPF.** CENTRO DE INVESTIGACIONES PRINCIPE FELIPE; **FISEVI.** FUNDACIÓN ANDALUZA PARA LA GESTIÓN DE LA INVESTIGACIÓN EN SALUD EN SEVILLA; **FABIS.** FUNDACIÓN ANDALUZA BETURIA PARA LA INVESTIGACIÓN EN SALUD; **FCAD.** FUNDACIÓN CÁDIZ-INVESTIGACIÓN BIOMÉDICA; **FIMABIS.** FUNDACION PÚBLICA ANDALUZA PARA LAINVESTIGACIÓN DE MÁLAGA EN BIOMEDICINA Y SALUD; **CRESIB.** CENTRO DE INVESTIGACIÓN EN SALUD INTERNACIONAL DE BARCELONA; **ISGLOBAL.** INSTITUTO DE SALUD GLOBAL DE BARCELONA
ISCIII Ranking of the top 10 Institutes of Health Research publication	2012	Previous R&D centres included
Red de Entidades Gestoras de Investigación Clínica Hospitalaria y Biosanitaria, REGIC: list of members and its associated insftutions	2012	Previous R&D centres included
"Eurociencia Programme" of the Spanish Ministry of Economy and Compebb yenes s from 2008 to 2011	2012	Previous R&D centres included
Community Research and Development Information Service, CORDIS: 7th Framework Programme results for Spanish participants, Medicine and Health Research Area	2012	Previous R&D centres included

Source: ***Own elaboration***

After this extensive review, in 2013 we consulted the adequacy and suitability of the list of identified R&D centres to several experts from the *Oficina de Proyectos Europeos* (ISCIII European Office, OPE), who agreed with our search, but recommended us to introduce few additional ISCIII entities to the population list. Moreover, they checked the list of contact persons we had found for every centre of the sample (Directors and/or Heads of RMO), and confirmed names and positions in a large number of these institutions. The relation of proposed entities for this dissertation was also checked and agreed by experts at the European Office (OE) of the Spanish Ministry of Economy, Industry and Competitiveness through the Secretary of State for Research, Development and Innovation (SGCTI). The European Office of MINECO aims to promote the participation and leadership of researchers and R&D Spanish entities in Horizon 2020.

Finally, we concluded that the size of the population for this study was 77 Spanish public R&D centres. Among the 77 centres, 12 belonged to the ISCIII, 18 were R&D institutions accredited by the ISCIII, 23 were CSIC centres, 9 were CIBER, and 15 belonged to other type of R&D entities. Table 4 shows the 77 entities which conform the total population, classified according to their type of institution. In 2014, after the selection was made and the data collection process started, 9 new institutes have been accredited by the ISCIII.

Table 4. Total Population of the Study

	CENTRES OF THE INSTITUTO DE SALUD CARLOS III, ISCIII
1	CNM. CENTRO NACIONAL DE MICROBIOLOGÍA
2	CNSA. CENTRO NACIONAL DE SANIDAD AMBIENTAL
3	CNMTrop. CENTRO NACIONAL DE MEDICINA TROPICAL
4	IIER. INSTITUTO DE INVESTIGACIÓN DE ENFERMEDADES RARAS
5	CNIO. FUNDACION CENTRO NACIONAL DE INVESTIGACIONES ONCOLOGICAS CARLOS III
6	CIEN. FUNDACIÓN CENTRO DE INVESTIGACION DE ENFERMEDADES NEUROLÓGICAS
7	CNIC. CENTRO NACIONAL DE INVESTIGACION CARDIOVASCULAR CARLOS III
8	CNE. CENTRO NACIONAL DE EPIDEMIOLOGÍA

Table 4. Total Population of the Study (cont.)

9	INVESTEN. UNIDAD DE INVESTIGACIÓN EN CUIDADOS DE SALUD
10	UNIDAD DE INVESTIGACIÓN EN TELEMEDICINA Y E-SALUD
11	UNIDAD FUNCIONAL DE INVESTIGACIÓN EN ENFERMEDADES CRÓNICAS
12	AETS. AGENCIA DE EVALUACIÓN DE TECNOLOGÍAS SANITARIAS
	RESEARCH INSTITUTES ACREDITED BY THE ISCIII
13	IDIBAPS. INSTITUT D' INVESTIGACIONS BIOMÉDICAS AUGUST PI Y SUNYER
14	IDIBELL. INSTITUT D' INVESTIGACIÓ BIOMÉDICA DE BELLVITGE
15	IR-HUVH. INSTITUT DE RECERCA HOSPITAL UNIVERSITARI VALL D' HEBRON
16	IGTP. INSTITUT D' INVESTIGACIÓ EN CIÉNCIES DE LA SALUT GERMANS TRIAS I PUJOL
17	IIS LA FE. FUNDACIÓN PARA LA INVESTIGACIÓN DEL HOSPITAL UNIVERSITARIO LA FE
18	IIS-PRINCESA. INSTITUTO DE INVESTIGACIÓN SANITARIA HOSPITAL UNIVERSITARIO DE LA PRINCESA
19	IISFJD. INSTITUTO DE INVESTIGACIÓN SANITARIA FUNDACIÓN JIMÉNEZ DÍAZ
20	i+12. INSTITUTO DE INVESTIGACIÓN HOSPITAL 12 DE OCTUBRE
21	IMIBIC. INSTITUTO MAIMÓNIDES DE INVESTIGACIÓN BIOMÉDICA DE CÓRDOBA (FIBICO)
22	IIS BIODONOSTIA. INSTITUTO DE INVESTIGACIÓN SANITARIA BIODONOSTIA
23	IISGM. INSTITUTO DE INVESTIGACIÓN SANITARIA GREGORIO MARAÑÓN
24	IdISSC. INSTITUTO DE INVESTIGACIÓN SANITARIA DEL HOSPITAL CLÍNICO SAN CARLOS
25	IDIS. INSTITUTO DE INVESTIGACIÓN SANITARIA DE SANTIAGO DE COMPOSTELA
26	IDIPAZ. INSTITUTO DE INVESTIGACIÓN SANITARIA HOSPITAL LA PAZ
27	IRYCIS. INSTITUTO RAMÓN Y CAJAL DE INVESTIGACIÓN SANITARIA
28	IIB SANT PAU. INSTITUTO DE INVESTIGACIÓN BIOMÉDICO SANT PAU
29	INCLIVA. INSTITUTO DE INVESTIGACIÓN SANITARIA FUNDACIÓN PARA LA INVESTIGACIÓN DEL HOSPITAL CLÍNICO DE VALENCIA
30	FIMIM. FUNDACION INSTITUTO HOSPITAL DEL MAR DE INVESTIGACIONES BIOMÉDICAS

Table 4. Total Population of the Study (cont.)

	CENTRES OF THE NATIONAL RESEARCH COUNCIL, CSIC
31	CBMSO. CENTRO DE BIOLOGIA MOLECULAR SEVERO OCHOA
32	CIB. CENTRO DE INVESTIGACIONES BIOLOGICAS
33	INRIC. INSTITUTO CAJAL
34	IPBLN. INSTITUTO DE PARASITOLOGIA Y BIOMEDICINA LOPEZ NEYRA
35	CABD. CENTRO ANDALUZ DE BIOLOGIA DEL DESARROLLO
36	IBMB. INSTITUTO DE BIOLOGIA MOLECULAR DE BARCELONA
37	IIBB. INSTITUTO DE INVESTIGACIONES BIOMEDICAS DE BARCELONA
38	IBV. INSTITUTO DE BIOMEDICINA DE VALENCIA
39	IN. INSTITUTO DE NEUROCIENCIAS
40	IBBTEC. INSTITUTO DE BIOMEDICINA Y BIOTECNOLOGIA DE CANTABRIA
41	CABIMER. CENTRO ANDALUZ DE BIOLOGIA MOLECULAR Y MEDICINA REGENERATIVA
42	CIC. CENTRO DE INVESTIGACION CARDIOVASCULAR
43	CID. CENTRO DE INVESTIGACION Y DESARROLLO PASCUAL VILA
44	CNB. CENTRO NACIONAL DE BIOTECNOLOGIA
45	IBFG. INSTITUTO DE BIOLOGIA FUNCIONAL Y GENOMICA
46	IBMCC. INSTITUTO DE BIOLOGIA MOL. Y CEL. DEL CANCER DE SALAMANCA
47	IBGM. INSTITUTO DE BIOLOGIA Y GENETICA MOLECULAR
48	IIBM. INSTITUTO DE INVESTIGACIONES BIOMEDICAS ALBERO SOLS
49	UBF. UNIDAD DE BIOFISICA
50	IG. INSTITUTO DE LA GRASA
51	ICTAN. INSTITUTO DE CIENCIA Y TECNOLOGIA DE ALIMENTOS Y NUTRICION
52	CIAL. INSTITUTO DE INVESTIGACIÓN EN CIENCIAS DE LA ALIMENTACIÓN
53	IBIS. INSTITUTO DE BIOMEDICINA DE SEVILLA
	CENTROS DE INVESTIGACIÓN BIOMÉDICA EN RED (CIBER)
54	*CIBERER. ENFERMEDADES RARAS*
55	*CIBERESP. EPIDEMIOLOGÍA Y SALUD PÚBLICA*
56	*CIBERDEM. DIABETES Y ENFERMEDADES METABÓLICAS ASOCIADAS*

Table 4. Total Population of the Study (cont.)

57	*CIBEROBN. FISIOPATOLOGÍA DE LA OBESIDAD Y NUTRICIÓN*
58	*CIBEREHD. ENFERMEDADES HEPÁTICAS Y DIGESTIVAS*
59	*CIBERNED. ENFERMEDADES NEURODEGENERATIVAS*
60	*CIBERES. ENFERMEDADES RESPIRATORIAS*
61	*CIBERBBN. BIOINGENIERÍA, BIOMATERIALES Y NANOMEDICINA*
62	*CIBERSAM. SALUD MENTAL*
	OTHER RESEARCH INSTITUTIONS
63	FISABIO-SALUD PÚBLICA. FUNDACIÓN PARA EL FOMENTO DE LA INVESTIGACIÓN SANITARIA Y BIOMÉDICA DE LA COMUNITAT VALENCIANA
64	FUNDACION INVESTIGACION BIOMEDICA HOSPITAL PUERTA DE HIERRO
65	FFIS. FUNDACION PARA LA FORMACION E INVESTIGACION SANITARIAS DE LA REGION DE MURCIA
66	O+IKER. FUNDACION VASCA DE INNOVACION E INVESTIGACIÓN SANITARIAS
67	IBI. INSTITUTO DE INVESTIGACIÓN BIOMEDICA DE VIGO (IBI)
68	CIPF. CENTRO DE INVESTIGACIONES PRINCIPE FELIPE
69	CIBIR. CENTRO DE INVESTIGACIÓN BIOMÉDICA LA RIOJA
70	FISEVI. FUNDACIÓN ANDALUZA PARA LA GESTIÓN DE LA INVESTIGACIÓN EN SALUD EN SEVILLA
71	FABIS FUNDACION ANDALUZA BETURIA PARA LA INVESTIGACION EN SALUD
72	FIBAO. FUNDACION INV. BIOSANITARIA EN ANDALUCIA ORIENTAL ALEJANDRO OTERO
73	FCAD. FUNDACION CÁDIZ- INVESTIGACION BIOMEDICA
74	FIMABIS. FUNDACION PUBLICA ANDALUZA PARA LA INVESTIGACION DE MALAGA EN BIOMEDICINA Y SALUD
75	CRESIB. CENTRO DE INVESTIGACION EN SALUD INTERNACIONAL DE BARCELONA
76	ISGLOBAL. INSTITUTO DE SALUD GLOBAL DE BARCELONA
77	CREAL. FUNDACIO CENTRE DE RECERCA EN EPIDEMIOLOGIA AMBIENTAL

Source: ***Own elaboration***

5.1.2. Data Collection and Final Sample

Before starting the data collection process, we revised the population characteristics and decided to exclude the 9 CIBER centres from our population, since these associations of research groups, although linked to the National Health System, are geographically decentralized and their R&D teams were simultaneously being included amongst the rest of R&D centres. In this sense, we preferred to avoid conflicts of duplication of data when collecting information about their research areas and projects managed by their RMO.

Thereby, the final population considered in our study consisted of 68 Spanish R&D public centres and institutes, which conduct their activities in Biomedicine and Health research areas, and located through the Spanish geography. These types of entities have their own R&D departments or key research areas, and their own international project management offices, which were also approached.

We approached the data collection through a complex process, trying to get data from several sources of information in each centre. In order to achieve a sample to be approached with an acceptable degree of representativeness and consistency, as well as viable in terms of data collection costs, we contacted 47 centres, 69,11% of the total population. Specifically, 24 centres (51,0%) were located in Madrid (8 belonged to the ISCIII, 7 were R&D institutions accredited by the ISCIII, 7 were CSIC centres and 1 was other type of R&D entities); 11 centres (23,4%) were located in Cataluña (6 were R&D institutions accredited by the ISCIII, 3 were CSIC centres and 1 was other type of R&D entities); 6 centres (12,8%) were located in the Valencia Region (2 were R&D institutions accredited by the ISCIII, 2 were CSIC centres and 2 were other type of R&D entities); and finally, 1 research institute (2,13%) accredited by the ISCIII was located in Galicia, 4 CSIC centres (8,51%) were located in Andalucía, and 1 centre of CSIC (2,13%) was located in Cantabria.

Table 5 and Table 6 show the final sample and the distribution of the total sample by research centre, type of institution and geographic area.

Table 5. Final Sample and Distribution by Type of Institution, Research Institutes and Geographic Area

	CENTRES OF THE INSTITUTO DE SALUD CARLOS III	Region
1	CNM. CENTRO NACIONAL DE MICROBIOLOGÍA	Madrid
2	CNSA. CENTRO NACIONAL DE SANIDAD AMBIENTAL	Madrid
3	CNMTrop. CENTRO NACIONAL DE MEDICINA TROPICAL	Madrid
4	IIER. INSTITUTO DE INVESTIGACIÓN DE ENFERMEDADES RARAS	Madrid
5	CNIO. FUNDACION CENTRO NACIONAL DE INVESTIGACIONES ONCOLOGICAS CARLOS III	Madrid
6	CNIC. CENTRO NACIONAL DE INVESTIGACION CARDIOVASCULAR CARLOS III	Madrid
7	CNE. CENTRO NACIONAL DE EPIDEMIOLOGÍA	Madrid
8	INVESTEN. UNIDAD DE INVESTIGACIÓN EN CUIDADOS DE SALUD	Madrid
9	UNIDAD DE INVESTIGACIÓN EN TELEMEDICINA Y E-SALUD	Madrid
	RESEARCH INSTITUTES ACREDITED BY THE ISCIII	
10	IDIBAPS. INSTITUT D' INVESTIGACIONS BIOMÉDICAS AUGUST PI Y SUNYER	Cataluña
11	IDIBELL. INSTITUT D' INVESTIGACIÓ BIOMÉDICA DE BELLVITGE	Cataluña
12	IR-HUVH. INSTITUT DE RECERCA HOSPITAL UNIVERSITARI VALL D'HEBRON	Cataluña
13	IGTP. INSTITUT D' INVESTIGACIÓ EN CIÉNCIES DE LA SALUT GERMANS TRIAS I PUJOL	Cataluña
14	IIS LA FE. FUNDACIÓN PARA LA INVESTIGACIÓN DEL HOSPITAL UNIVERSITARIO LA FE	Com Valenciana
15	IIS-PRINCESA. INSTITUTO DE INVESTIGACION SANITARIA HOSPITAL UNIVERSITARIO DE LA PRINCESA	Madrid
16	IISFJD. INSTITUTO DE INVESTIGACIÓN SANITARIA FUNDACIÓN JIMÉNEZ DÍAZ	Madrid
17	i+12. INSTITUTO DE INVESTIGACIÓN HOSPITAL 12 DE OCTUBRE	Madrid
18	IiSGM. INSTITUTO DE INVESTIGACION SANITARIA GREGORIO MARAÑÓN	Madrid
19	IdISSC. INSTITUTO DE INVESTIGACIÓN SANITARIA DEL HOSPITAL CLÍNICO SAN CARLOS	Madrid
20	IDIS. INSTITUTO DE INVESTIGACIÓN SANITARIA DE SANTIAGO DE COMPOSTELA	Galicia
21	IDIPAZ. INSTITUTO DE INVESTIGACIÓN SANITARIA HOSPITAL LA PAZ	Madrid

Table 5. Final Sample and Distribution by Type of Institution, Research Institutes and Geographic Area (cont.)

22	IRYCIS. INSTITUTO RAMÓN Y CAJAL DE INVESTIGACIÓN SANITARIA	Madrid
23	IIB SANT PAU. INSTITUTO DE INVESTIGACIÓN BIOMÉDICO SANT PAU	Cataluña
24	INCLIVA_ INSTITUTO DE INVESTIGACIÓN SANITARIA FUNDACIÓN PARA LA INVESTIGACIÓN DEL HOSPITAL CLÍNICO DE VALENCIA	Com Valenciana
25	FIMIM. FUNDACION INSTITUTO HOSPITAL DEL MAR MAR DE INVESTIGACIONES BIOMÉDICAS	Cataluña
	CENTRES OF THE NATIONAL RESEARCH COUNCIL (CSIC)	
26	CENTRO DE BIOLOGÍA MOLECULAR SEVERO OCHOA (CBMSO)	Madrid
27	CENTRO DE INVESTIGACIONES BIOLÓGICAS (CIB)	Madrid
28	INSTITUTO CAJAL (INRIC)	Madrid
29	CENTRO ANDALUZ DE BIOLOGÍA DEL DESARROLLO (CABD)	Andalucía
30	INSTITUTO DE BIOLOGÍA MOLECULAR DE BARCELONA. IBMB	Cataluña
31	INSTITUTO DE INVESTIGACIONES BIOMÉDICAS DE BARCELONA (IIBB)	Cataluña
32	INSTITUTO DE BIOMEDICINA DE VALENCIA (IBV)	Com Valenciana
33	INSTITUTO DE NEUROCIENCIAS	Com Valenciana
34	INSTITUTO DE BIOMEDICINA Y BIOTECNOLOGÍA DE CANTABRIA (IBBTEC)	Cantabria
35	CENTRO ANDALUZ DE BIOLOGÍA MOLECULAR Y MEDICINA REGENERATIVA (CABIMER)	Andalucía
36	CENTRO DE INVESTIGACIÓN CARDIOVASCULAR (CIC)	Cataluña
37	CENTRO NACIONAL DE BIOTECNOLOGÍA (CNB)	Madrid
38	INSTITUTO DE INVESTIGACIONES BIOMEDICAS ALBERO SOLS (IIBM)	Madrid
39	INSTITUTO DE LA GRASA. CSIC	Andalucía
40	INSTITUTO DE CIENCIA Y TECNOLOGIA DE ALIMENTOS Y NUTRICIÓN. ICTAN	Madrid
41	INSTITUTO DE INVESTIGACIÓN EN CIENCIAS DE LA ALIMENTACIÓN (CIAL)	Madrid
42	IBIS. INSTITUTO DE BIOMEDICINA DE SEVILLA	Andalucía
	OTHER RESEARCH INSTITUTIONS	
43	FISABIO - SALUD PÚBLICA. FUNDACIÓN PARA EL FOMENTO DE LA INVESTIGACIÓN SANITARA BIOMÉDICA DE LA COMUNITAT VALENCIANA	Com Valenciana
44	FUNDACIÓN INVESTIGACIÓN BIOMÉDICA HOSPITAL PUERTA DE HIERRO	Madrid
45	CIPF. CENTRO DE INVESTIGACIONES PRINCIPE FELIPE	Com Valenciana
46	ISGLOBAL INSTITUTO DE SALUD GLOBAL DE BARCELONA	Cataluña
47	FUNDACIÓ CENTRE DE RECERCA EN EPIDEMIOLOGIA AMBIENTAL - CREAL	Cataluña

Source: *Own elaboration*

Table 6. Total Sample Distribution by Geographic Area

REGION	NUMBER OF CENTRES (%)
Madrid	24 (51,0%)
Cataluña	11 (23,4%)
Comunidad Valenciana	6 (12,8%)
Andalucía	4 (8,51%)
Galicia	1 (2,13%)
Cantabria	1 (2,13%)
TOTAL	**47 (100%)**

Source: ***Own elaboration***

5.2. SOURCES OF INFORMATION

This section explains the procedures applied for collecting information: questionnaire design, media used for their launching and distribution, monitoring, and other actions undertaken in the process of data collection. Obtaining the data to empirically study the hypotheses was considered one of the main points in the development of this thesis. The process carried out for this purpose was planned with rigor, especially the steps conducted to ensure high quality of the data obtained. Thus, for collecting the appropriate data for the empirical analysis, the sources of information used in the study combined both primary and secondary data.

We used secondary data in order to identify the contact details of the research teams to be included within the sample. In this sense, we studied the structure and composition of the R&D groups of the R&D institutions included in the population. This information was available in the annual scientific reports published by each R&D centre during 2013 and 2014, and it contained diverse data about their research and managerial staff, the areas or departments that comprise the organization, the organizational structure, number of signed agreements per year, main scientific publications, research projects gained and activities developed by type and funding agency, competitive funds raised, etc. With the purpose of getting as much information as possible about the sample and the size and composition of their research work groups and departments goals, reports from national R&D Institutions and governmental agencies were collected (Ministry of Economy, Industry and Competitiveness, the *Instituto de Salud "Carlos III*", the Ministry of Education, Culture and Sports, etc.). Therefore, reports prepared by the European Project Offices from the National Ministries with competences in R&D issues, among others, were collected too. Additionally, diverse public databases available by national R&D institutions were consulted.

Due to the importance and interest elicited by the study, in January 2013, a meeting with the Director of the ISCIII and the Deputy Director of the ISCIII European Office was arranged at their facilities. We introduced the study to the Institute and got their future commitment to the project though information provision about Spanish R&D entities, and a support letter to be signed by the Director. The ISCIII recommended us to inform the MINECO about the project objectives, goals and potential results, in order to align actions between both national institutions and also benefit MINECO from the project potential outcomes. In this sense, and thanks to the joint efforts made by the ISCIII and our research team, another meeting was settled up in June 2013, with the European Office Director of MINECO-FECYT and the Deputy Director of Foreign International Affairs with Europe of MINECO, at the State Secretariat for Research, Development and Innovation headquarters (SGCTI). The SGCTI is responsible for the policies of scientific and technical research, development and innovation, including the management of international relations in this area and the Spanish representation in programmes, and international organizations and forums of the European Union competence. During this meeting, the personnel of MINECO and the European Office showed high interest in the topic, and their will to support the project development and results with a letter of intent.

The most valuable data to be provided by those key actors was the amount of European projects applied and gained by the R&D entities included in our sample. To obtain additional and objective information about the number of projects managed by each Spanish centre, for both applied and granted projects, at international and even national scope, would be of main value for the reliability and assurance of the project. Even more, it would significantly reduce the data collection costs. Thus, discussions about how to deal and above all how to obtain this data (the Dependent Variable of the study) were approached in depth. The information about R&D gained projects and the Spanish institutions which had participated in European competitive financing programmes in latest years, is compiled in a national database fully managed by the Centre for the Development of Industrial Technology (CDTI). CDTI is a Public Business Entity, depending of the MINECO, whose main objective is to foster the technological development and innovation of Spanish companies. It is the entity that channels the funding and support applications for national and international R&D projects of Spanish companies.

In October 2013, the project was certified by the Ethics Commission in Experimental Research of the Ethics Committee of Research in Humans of the University of Valencia. After this procedure, and work in close collaboration with the European Office of the MINECO-FECYT, in January 2014, a new meeting was set up with the General Secretariat of Science, Technology and Innovation at the MINECO in Madrid, together with the European Office Director of MINECO-FECYT. During this meeting, the interest about the project potential results were extremely recognized as a way of acquiring new and useful knowledge to improve current Spanish R&D public policies. In fact, the work basis with CDTI and the MINECO-FECYT for obtaining the accurate data about European projects, applied and gained by Spanish R&D institutions, were established. As a matter of fact, both letters of support, signed by the Director of the ISCIII and by the General Secretary of Science, Technology, and Innovation at MINECO –at that time President of CDTI- were received. Finally, in June 2015, we obtained the available data CDTI could provide us from the official database of the Spanish participation in the 7th Framework Programme 2008-2013 (CORDA database). The data taken from CORDA included the European projects gained by beneficiaries as coordinators and partners, but unfortunately, it did not showed the number of projects applied per beneficiary. In addition, the amount of projects obtained by entity did not differentiate specific programmes within the 7th Framework Programme Health Sciences Area. Moreover, some centres, like the ones belonging to the ISCIII or CSIC, with common identical Participant Identification Code (PIC), could not differentiate the information among their centres and institutes, but the data was shown in global, aggregating those entities results as a whole figure. Nevertheless, the information submitted by CDTI was kept for later analysis, with the purpose of comparing and analyse outcomes between institutions in the results chapter and forthcoming studies.

5.3. DESIGN OF QUESTIONNAIRES

The primary data sources are based on unpublished data, on information that usually is obtained through personal interviews and questionnaires. For this study, we employed a survey method to collect data; being the information and inputs we got from the previously described sources very helpful tools in the design of our first questionnaire surveys.

Since the main objective of the study is the analysis of the factors that explain the effectiveness of public R&D institutions when applying and gaining biomedical research funds from main European competitive programmes (e.g. EC Horizon 2020) and help them to become more competitive, the project was named "*The Spanish 2020 Challenge*". The study was introduced with this title to the Spanish Public authorities with competences in national R&D policies, and the questionnaires surveys were subsequently launched to our key actors. Indeed, our ultimate objective was to obtain manageable parameters that will help Spanish public R&D institutions in the field of Biomedicine and Health to improve their European projects ratio, therefore being more competitive in Europe, while aligning their strategy with the MINECO for the Horizon 2020 Programme. Therefore, the title of the study continuously referred the project mission and coincided with the current National Plan for Scientific and Technological Research, and Innovation 2013-2016 objectives. From each institution of the sample and for the optimal project development, the maximum possible collaboration was requested. To collect the primary data, the research team developed four different types of questionnaires, to be answered by three basic actors in each entity of the sample:

- Questionnaire to the CEO/Director of the R&D Centres: *The Spanish 2020 Challenge*
- Questionnaire to the Heads or Responsible persons at the different R&D Areas, differentiated in 2 parts: *The Spanish 2020 Challenge - Research*

Areas Directors; and *The Spanish 2020 Challenge - Research Support Areas Directors*

- Questionnaire to the Head or Responsible person at the Project Management Office or International Projects Management Department: *Spanish 2020 challenge - Research Office*

Surveys on top managers may suffer from low response rates, less than 25 per cent (Pettigrew, 1992). To ensure the highest possible response, we included an in-depth pre-test to streamline the questionnaires, a review of all surveys by a panel of experts in the fields of Biomedicine and Management Research Areas, and an engagement of respondents' interest in the topic by further implication in the results. Since the availability of data from CDTI could significantly vary all questionnaires contents, and the likelihood to get the Dependent Variable of our study was an uncertain till 2015, we were unable to complete the design of our surveys till the end of 2014. Previous versions of all questionnaires were discussed with academics and tested by different managers at R&D public institutions for their advice and evaluation. All surveys were going to include questions about the characteristics of the work groups members in order to have demographic data about these professionals (e.g. background of the staff, qualifications, professional profiles, languages skills, international experience, motivations and values, flexibility, work capacity, relations with other groups and entities, team less, etc.). The development of the first surveys versions coincided with a pre-doctoral stay of three months at the Faculty of Management of Cass Business School (City University London, UK). In this Faculty, we asked for advice to researchers of Entrepreneurship, Innovation and managerial relations fields, namely Senior Lecturer Dr. Susan Hill, Dr. Stefania Zerbinati and Professor Vangelis Souitaris, Senior Lecturers in Entrepreneurship and Innovation. They suggested to review literature on European funding policies by local government authorities at European regions, and to include some specific questions about transfer of knowledge and technology innovation (patents, licenses, spin-offs, etc.), since much of the literature considers this a very important aspects in scientific collaborations and social networks. Secondly, they suggested asking for the type of research done by the different research groups, to identify which groups activities were more basic-research based, and which R&D groups may be work closer to the market (relations with industry and business collaborations).

The four survey questionnaires were transferred to the *SocialSci* online platform to be directly answerer by the target audience. We chose this participant pool because it had been largely used by researchers around the world, helping them to collect data for their surveys and experiments. It was a robust survey editor that allowed us to import programming into our study, and it was 100% free for participants without keeping any personal identifiable data.

The platform allowed us to develop the full scientific process to be conducted online, while reaching our global audience. Thus, in November, 2014, both the CEO and the Research Management questionnaires pre-test started. We consulted 4 different Directors, and 4 Heads of Research Project Offices from the Public Health Department of the Regional Ministry of Health (Regional Government of Valencia) and from both public Universities of Valencia, most of them potential participants in the study. After a large and comprehensive review of both questionnaires, two new questions were incorporated in the "Spanish 2020 challenge-Research Office". The first added question dealt with the amount of international competitive funding projects applied and achieved by each entity. The second question was focused on the type of activities developed by the Office in project management issues. An additional question about the specialized managerial structures in project management within the organization and their potential influence in decision-making when applying to international projects was included in the questionnaire addressed to the CEOs. In regard to the questionnaire designed to be posted to the Heads of the main Research Areas identified in the sample, or even to the researchers leading R&D lines within the key research areas, in February 2015 those pre-tests were finished, with the participation of 6 different Research Areas Responsible. Due to the length of the questionnaire, the nature of the information to collect and its complex approach, we decided to divide it in two parts. One part would had to be fulfilled by the Head or responsible of the R&D group, due to the fact some questions would collect subjective data referred to perceptions, preferences, priorities, incentives, etc. of the research team (*The Spanish 2020 Challenge-Research Areas Directors*). Indeed, this part would collect non-observable data related to some perceptions these groups may have about the support they receive from their entity (CEO and TMT), about their relationships with other R&D areas inside and outside the centre, the interactions with their R&D management units, the relations with other groups, the international projects requested and obtained, etc. The second part of the survey *-The Spanish 2020 Challenge-Research Support Areas Directors-* included just observable and objective data about applications and projects gained by the R&D group, and it was going to collect demographic information about the research work teams. Thus, it could be fulfilled by technical staff or personnel who managed objective data about their projects and scientific results within the team.

5.4. VARIABLES AND MEASUREMENT SCALES

For the measurement of the variables of the study, we have used different scales in order to avoid the Common Method Variance (CMV). We used survey instruments –mainly questionnaires– to collect different data from the diverse key actors. But when self-report questionnaires are used to collect data at the same time from the same participants, CMV may be a concern since it is the amount of false correlation between variables that is created by using the same method to measure each variable (Podsakoff, MacKenzie, Lee and Podsakoff, 2003). CMV may lead to erroneous conclusions about relationships between variables by inflating or deflating CMV may (Craighead, Ketchen, Dunn, Hult, 2003), being attributable to the measurement method rather than to the constructs the measures represent (Chang, van Witteloostuijn and Eden, 2010; Lindell and Whitney, 2001; Podsakoff et al. 2003). To control this effect, we will evidence construct validity for the questionnaire measures and the variables, which have been measured using diverse scales independently of the questionnaires.

5.4.1. Dependent and Independent Variables

A number of independent variables have to be considered in the study. Independent variables were collected via questionnaire surveys. The questionnaire survey allowed us to gather information not publicly available, especially with respect to R&D policies followed within Spanish public institutions and their competitive fundraising activities. The first survey used was a questionnaire addressed to the Director of the R&D centres, which consisted in 5 different parts for the identification of diverse independent variables.

In the first part, respondents were asked about their priorities or main objectives followed by the institution during the last 5 years in relation to research management issues. The content to codify for this variable was taken from data included in the annual scientific reports of most centres of our sample, from 2013-2015, since at least 80% of them included these data in their annual reports. We used a 3-items *Likert* scale: “priority”, “not a priority”, “nor performed”, pointing the maximum and minimum priority option. In the second part of the questionnaire, respondents were asked to assess the research staff recruitment within their centres, considering 3 dimensions for this variable: Recruitment actions, desired profile of searched and employed researchers, and actions undertaken to promote and advertise those jobs. A 5-items *Likert* scales, being 1 “Not considered” or “Not performed” and 5 “Very high” or “Crucial considered” was used and they were formulated according to the type of contracts usually offered by public R&D Biomedical entities in Spain, the existing formal position categories for researchers that are currently offered by institutions (such as the CSIC, the ISCIII, etc.) and the type of advertising/publishing a public R&D institution shall follow in Spain to enforce law with public contracts funded by competitive calls. The incentives policy followed by the institution to boost the application and acquisition of international funded projects was collected in the third part of the survey. The variable motivation and promotion of international research projects application and their success or to what extend the organization provides different incentives, both intrinsic and extrinsic, when researchers gain competitive projects, was adapted from the scale of Linz and Semykina (2012). Most of the items were adapted and modified to fit our research context, using a 5-items *Likert* scales, being 1 “Not done” and 5 “Always done”. Part four of the questionnaire was concerned to decision-making processes when applying to international competitive projects, and respondents were asked to assess the current managerial structures their centres provide to researchers in order to promote projects and support this process. We used a dichotomous scale “Exist”-“Do not exist”. The content for the decision-making processes when applying to international competitive projects variable items was taken from the annual reports and web sites of the centres of the sample and other technological institutes, since the research and management structures incorporated are usually described in these kind of organizations. The dimension of the variable to measure the influence degree of this departments, units or groups regarding latest decisions about call selection and proposals application to international competitive grants, was also asked to respondents. We used a 4-items *Likert* scale being 1 "Not exist" and 4 "Absolute influence". Finally, in part five of the questionnaire respondents were asked about some of their personal-professional characteristics, in order to get the CEOs demographic profile variable. We included 10 different items to assess their background, tenure, experience in the job, professional profile, etc. We used nominal, ordinal and numerical scales to measure this data. The items constructed for the scales are presented in Table 7.

Table 7. Measures of CEOs Questionnaire

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Priorities for the institution	Type of Objective	1.1. A To obtain funds by national and regional competitive projects	*Likert* scales with 3 options: "priority", "not a priority", "nor performed"
		1.1. B To obtain funds by international competitive projects	
		1.1. C Agreements with other entities and R&D organizations	
		1.1. D Transfer of technology/ setting of Spin-Offs/transfer of licenses / patent selling	
		1.1. E To get funding by other alternative ways	
		1.1. F To increase the number of scientific publications	
		1.1. G To increase the number of divulgative publications	
		1.1. H To obtain patents	
		1.1.I To increase the number of research staff at the centre	
		1.1. J To increase the number of doctoral theses	
		1.1. K Agreements with companies/ private firms (e.g. Clinical trials, R&D service contracts, etc.)	
		1.1. L To organize scientific activities (e.g. Congresses, workshops, etc.)	

Table 7. Measures of CEOs Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Research Staff Actions in the last five years	Recruitment actions for research staff	2.1.1 Award of public funds by specific Human Resources competitive calls	*Likert* scales from 1 "Not considered" or "Not performed" to 5 "Very high" or "Crucial considered".
		2.1.2 Award of public funds via competitive projects funding calls in order to contract research staff	
		2.1.3 Award of funds from agreements signed with companies and/or other institutions to contract research personnel	
		2.1.4 Award of core funding from the own centre in order to contract researchers	
	Desired profile of searched and employed researchers	2.2.1 Search and hire researchers of very high level – Star scientist- (attraction of excellence)	
		2.2.2 Search and hire experimented researchers (attraction of talent)	
		2.2.3 Search and contract novel promising researchers (training of talent)	
	Actions undertaken to promote and advertise research jobs	2.3.1 Publication on the Website of the centre	
		2.3.2 Diffusion and sending of offers to other centres and institutions, and to known work networks	
		2.3.3 Publication of offers on the official national and regional media (Official State Bulleting, etc.)	
Incentives Policy	Type of Incentives	3.1.1 It positively affects the salary of the research team who obtain the project	Adapted from Linz and Semykina, 2012. *Likert* scales from 1 "Not done" to 5 "Always done"
		3.1.2 It positively affects the salary of ALL staff of the centre, even though not pertaining to the research group who get the international project	
		3.1.3 It provides the project application group's higher safety to keep their jobs	

Table 7. Measures of CEOs Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Incentives Policy	Type of Incentives	3.1.4 It increases the promotion opportunities for the R&D team who acquire the project	Adapted from Linz and Semykina, 2012. *Likert* scales from 1 “Not done” to 5 “Always done”
		3.1.5 It improves the appreciation and respect applicant team researchers receive from the rest of their centre staff	
		3.1.6 It improves the recognition team members receive from their superiors	
		3.1.7 It provides the members of the applicant team greater freedom, in terms of time flexibility, autonomy, less supervision, etc.	
		3.1.8 It enables the members of the project applicant team to achieve objectives which are worthy for them	
		3.1.9 It opens opportunities for the applicant team members to learn new techniques or things	
		3.1.10 It allows the applicant R&D team members to develop things that make them feel good with themselves	
		3.1.11 It offers to the team members good opportunities to develop their skills and abilities	
Decision-making processes when applying to international competitive projects	Type of Managerial Structures	4.1.1 Strategic Unit or Department of International Projects, specifically created to boost the participation in international competitive programmes (UEPI)	Dichotomous scale 0: “Exist“- 1: “Do not exist”
		4.1.2 Director of International Programmes, responsible of the dymanization and improvement of the centre participation in international competitive programmes (DPI)	
		4.1.3 Unit or Project Management Office of the centre (information, application, justification) (OGPI)	

Table 7. Measures of CEOs Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Decision-making processes when applying to international competitive projects	Type of Managerial Structures	4.1.4 Unit or Office of Technology Transfer of research results (TTO)	Dichotomous scale 0: “Exist“- 1: “Do not exist”
		4.1.5 Integrated Project Management Unit and Technology Transfer Office (OTRIPI)	
		4.1.6 Research Areas, with a clearly defined responsible or coordinator (AR)	
	Influence in Decision-making process	4.2.1 Influence of the Strategic Unit or Department of International Projects (UEPI)	*Likert* scale from 1 “Not exist” to 4 “Absolute influence”
		4.2.2 Influence of the Director of International Programmes (DPI)	
		4.2.3 Influence of the Unit or Project Management Office of the centre (OGPI)	
		4.2.4 Influence of the Unit or Office of Technology Transfer of research results (TTO)	
		4.2.5 Influence of the Integrated Project Management Unit and Technology Transfer Office (OTRIPI)	
		4.2.6 Influence of the Research Areas Responsible (AR)	
		4.2.7 Influence of the Managerial structures or TMT of the centre (TMT)	
		4.2.8 Influence of the CEO or Director of the centre (CEO)	
		4.2.9 Influence of Principal Investigators (PI)	
Demographic Characteristics of the CEO	Sex	Male	Nominal
		Female	
	Age	N	Numerical
	Background	Bachelor	Ordinal
		PhD	
	Tenure; Experience in the job	Initial year in current job	Numerical

Table 7. Measures of CEOs Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Demographic Characteristics of the CEO	Academic degree	Biology	Nominal
		Business/Economy	
		Pharmacy	
		Telecommunications Eng.	
		Medicine	
		Chemistry	

Source: ***Own elaboration***

The second survey was a questionnaire addressed to Head of the Project Management Office or the Responsible person of the International Projects Department, and consisted in 4 different parts for assessing some independent variables and the dependent variables of our study.

In the first part of the questionnaire respondents were asked to assess the activities developed by the research management staff. This included the measurement of **the independent construct "workload"**, or the amount of tasks research managers hold at each centre of the sample at their Research Management Offices. To obtain the workload of this offices, information about the different services provided by the management office staff to R&D groups when researchers apply for international competitive projects was collected. The content design for this data was taken from information included in the annual scientific reports of most of the centres of our sample, from 2013-2015, since at least 80% of them included these figures in their annual reports. We used 5-items *Likert* scales from 1 "None" to 5 "More than". Besides, respondents were asked about the composition of the research management office, included in part 3 of the survey. In particular for the variable workload, the total number of members of the office was also measured. The services provided to the R&D teams are part of the tasks and duties of these offices, but they may be more or less numerous and focused to the specific needs of the R&D groups' demands also depending on the number of persons at the office who implement research management activities, ergo the size of the office.

Thus, we measured this new independent construct dividing the amount of R&D management activities developed by the office between the numbers of people work at them. First part of the questionnaire also included 9 additional items to measure the activities developed by the research management staff variable, concerning results in the application and acquisition of competitive projects. The amount of projects applied to the main international funding programmes and gained by the centre, in the role of partners and coordinators, during the last 5 years were evaluated; and the figures of competitive funds applied and got by the institution, using diverse *Likert* scales. In addition, the type of professional services performed by the management office staff for supporting R&D groups when Principal Investigators tend to apply for international competitive projects was also considered through multiple items. We used 3-items *Likert* scales from 0 “No service” to 3 “Personalized service protocol”, and Dichotomous scale 0: “Exist” - 1: “Do not exist” for the last 4 items. The design of the content for this variable was taken from secondary data included in the annual scientific reports of most centres of our sample, from 2013-2015, within the research management chapter services and the centre websites section devoted to research support services to R&D groups, since at least 80% of them included these data in their annual reports. The Second part of this questionnaire focused on the policies adopted by the institution to increase the application and gain of international competitive funded projects. In particular, we measured the **independent variable incentives to research managers when gaining international competitive projects**. With regard to motivate and promote international research success rates, respondents were asked for potential and different incentives offered by the centre to research managers, both intrinsic and extrinsic rewards, when acquiring competitive projects. The scale of Linz and Semykina (2012) was adapted and modified to fit our research context. We used 5-items *Likert* scales, form 1 “Not done” to 5 “Always done”. R&D Management Office composition and the demographic characteristics of its staff members were measured in part three of the questionnaire. Respondents were asked about some of the personal-professional characteristics of the office members, in order to get their demographic profile variable. We included multiple numerical items to assess their background, tenure, experience in the job, professional profile, etc. Last part of the survey was built to get the main demographic characteristics of the Head of the Research Management Office, using common socio-demographic variables like educational background, tenure in the centre, experience in the job, etc. We used nominal and numerical scales to measure this data.

The dependent variables for our study were: Proactivity of the R&D groups and Effectiveness/productivity of the centres.

The variable proactivity in our study was defined as the amount of International competitive projects applied by researchers in the last 5 years, both in number of projects and the amount of competitive funding requested by each centre. The information was collected though the respondents within the activities developed by the Research Management Office, in part three of the research management offices questionnaire. To obtain this variable we gathered the amount of international competitive projects applied by the centre, the international competitive projects applied by the centre as coordinators, the total funding requested of international competitive projects and the total funding requested of international competitive projects as coordinators. We used a 5-items *Likert* scale for 4 differentiated items.

The variable effectiveness/productivity was measured by the quantity of international projects gained by the institutions in the last five years, both in quantity of projects and global amount of competitive funding obtained by each centre. The information was also surveyed within the activities developed by the Research Management Office, in part three of the research management offices questionnaire. To obtain this variable we assessed the international competitive projects gained by the centre, the international competitive projects gained by the centre as coordinators, the total funding gained by international competitive projects, and the total funding gained by international competitive projects as coordinators. We used a multiple 5-items *Likert* scales for 4 different items.

The dependent and independent variables, dimensions and items constructed for the scales are presented in Table 8.

Table 8. Measures of Head of the Project Management Office Questionnaire

VARIABLE LABEL	DIMENSIONS	QUESTIONNAIRE ITEMS	SCALE
Activities developed by the Research Management Office	Type of activities and tasks undertaken	1.1.1 Amount of international competitive projects managed	*Likert* scales from 1 “None” to 5 “More than 35”
		1.1.2 Applied projects to international competitive programmes	
		1.1.3 Transfer of technology: Number of patents managed	
		1.1.4 R&D international agreements managed	
		1.1.5 Number of agreements managed and funded by international competitive calls, to incorporate personnel	
		1.1.6 Spin-Offs settled from conducted R&D activities	
	International projects applied in the last 5 years	1.2 International competitive projects applied by the centre	*Likert* scale from 0 (None) to 5 (>100)
	International projects applied as coordinator	1.3 International competitive projects applied by the centre as coordinators	
Activities developed by the Research Management Office	International projects gained in the last 5 years	1.4 International competitive projects gained by the centre	*Likert* scale from 0 (None) to 4 (>36)
	International projects gained as coordinators	1.5 International competitive projects gained by the centre as coordinators	*Likert* scale from 0 (None) to 4 (>26)
	Total competitive funds applied from international agencies in the last five years	1.6.1 Total funding requested of international competitive projects	*Likert* scale from 0 (0 €) to 6 (>25 M€)
		1.6.2 Total funding requested of international competitive projects as coordinators	

Table 8. Measures of Head of the Project Management Office Questionnaire (cont.)

VARIABLE LABEL	DIMENSIONS	QUESTIONNAIRE ITEMS	SCALE
Activities developed by the Research Management Office	Total competitive funds gained from international agencies in the last five years	1.7.1 Total funding gained by international competitive projects	*Likert* scale from 0 (0 €) to 6 (>12 M€)
		1.7.2 Total funding gained by international competitive projects as coordinators	
	International projects applied and gained in the last 5 years by main funding programme	1.8. International Programmes Applied	*Likert* scale from 1 (Never applied) to 5 (≥20 applications)
		1.9. International Programmes Gained	*Likert* scale from 1 (Never gained)to 5 (>10 projects won)
	Main services provided to R&D groups when applying and managing international projects: Tasks and Activities	1.10.1 Dissemination of information to researchers about international competitive calls and programmes	*Likert*scales from 0 (No service) to 3 (Personalized service protocol)
		1.10.2 To provide researchers with all documentation associated to each competitive call	
		1.10.3 Management of applications	
		1.10.4 Project proposal applications follow up: from pre-award decision resolutions to formal acceptance of the grant.	
		1.10.5 Economic justifications of projects	
		1.10.6 Budget preparation of project proposals	
		1.10.7 Collaboration in the preparation of the scientific & technical reports	*Likert*scales from 0 (No service) to 3 (Personalized service protocol)
		1.10.8 Organization of seminars and training courses to researchers on project management	
		1.10.9 Communication and interaction with R&D groups to assess the application of new competitive projects	
		1.10.10 Management of Human Resources assigned to the project	

Table 8. Measures of Head of the Project Management Office Questionnaire (cont.)

VARIABLE LABEL	DIMENSIONS	QUESTIONNAIRE ITEMS	SCALE
Activities developed by the Research Management Office	Structures within the Office to support international projects applications: Type of Managerial Structures	1.10.11 The Office has clearly identified managers or specialist advisors for each competitive funding programme	Dichotomous scale 0: "Exist"-1: "Do not exist"
		1.10.12 The office has clearly identified managers or advisors in each R&D group	
		1.10.13 The Head of the R&D Management Office is part of the TMT of the centre	
		1.10.14 The Head of the R&D Management Office participates in the decision making process of which international competitive calls the centre may apply for	
Policies oriented to increase the applications and acquisition of international competitive funds	Incentives to Research Managers when gaining international competitive projects	2.1.1 It positively affects the salary of the members of the Research Management Office	Adapted from Linz and Semykina, 2012; *Likert* scales form 1 "Do not occur" to "always occurs"
		2.1.2 It positively affects the salary of ALL researchers of the centre, even though not pertaining to the group who get the international project	
		2.1.3 It provides the members of the Office higher safety to keep their jobs	
		2.1.4 It increases the promotion opportunities for the members of the Research Management Office	
		2.1.5 It improves the appreciation and respect members of the Office receive from the rest of the centre staff	
		2.1.6 It improves the recognition the Office members receive from their superior	
		2.1.7 It provides the members of the Office greater freedom, in terms of time flexibility, autonomy, less supervision, etc.	
		2.1.8 It enables the members of the Office to reach objectives which are worthy for them	
		2.1.9 It offers opportunities for the Office members to learn new things	
		2.1.10 It allows the Office members to develop things that make them feel good with themselves	

Table 8. Measures of Head of the Project Management Office Questionnaire (cont.)

VARIABLE LABEL	DIMENSIONS	QUESTIONNAIRE ITEMS	SCALE
Research Management Office composition and the demographic characteristics of its staff members	Characteristics of the office staff members	3.1.1 Total number of members of the Research Management Office	Numerical
		3.1.2 How many of them develop project management functions?	
		3.1.3 How many are women?	
		3.1.4 How many of them had previously worked in similar positions at other R&D centres?	
		3.1.5 How many of them have worked or work as researchers in addition to their current project management role?	
		3.1.6 How many of them are fluent in English language?	
		3.1.7 How many of them are civil servants or have permanent contracts?	
		3.1.8 How many of them are doctors or are doing a PhD?	
		3.1.9 How many of them are from other nationalities to the Spanish?	
		3.1.10 How many of them are members of Research Managers Associations (e.g. ARMA, REGIC...)	
Research Management Office composition and the demographic characteristics of its staff members	Tenure; Experience in the job	Tenure	Numerical
		Academic degrees (No of members)	
		Background /Education	
		Age (number of members)	
Demographic characteristics of the Head of the Research Management Office	Academic degree	Law	Nominal
		Documentation	
		Business/Economy	

Table 8. Measures of Head of the Project Management Office Questionnaire (cont.)

VARIABLE LABEL	DIMENSIONS	QUESTIONNAIRE ITEMS	SCALE
Demographic characteristics of the Head of the Research Management Office	Academic degree	Pharmacy	Nominal
		Physics	
		Telecommunications Eng.	
		English Philology	
		Philosophy	
		Medicine	
	Academic Degree and Background	Health Sciences	Nominal
		Non Health Sciences	
		Graduated	
		PhD	
		Bachelor	
	Sex	Male	Nominal
		Female	
	Age and Tenure in the Job	N	Numerical
		Years in the Centre	
		Years in current job	
	Type of Labour Contract	Civil Servant	Nominal
		Permanent Staff	
		Labour contract	
	English Language Level	Low	Nominal
		Medium	
		High	

Table 8. Measures of Head of the Project Management Office Questionnaire (cont.)

VARIABLE LABEL	DIMENSIONS	QUESTIONNAIRE ITEMS	SCALE
Demographic characteristics of the Head of the Research Management Office	French Language and other Languages Level	Low	Nominal
		Medium	
		High	
		German	Nominal
		German & Portuguese	
		Italian	

Source: ***Own elaboration***

For practical reasons when filling in the questionnaire designed for the Heads of R&D Areas, we divided it in two shorter questionnaire surveys: *The Spanish 2020 Challenge - Research Areas Directors and Research Support Areas Directors*. Research Support Areas Directors questionnaire was structured in two main sections. In the first part of the survey focused on the type of activities developed by the Area team members. The design of the content for this variable was taken from data included in the available annual scientific reports of the centres of the sample, since most of this information was described in the annual reports and websites of the participant institutions. We used 5-items *Likert* scales from 1 to 5, and a dichotomous scale "Yes" or "Not", depending on the past participation of the group in main specific competitive calls. Indeed, results in the application and gaining of competitive projects, meaning the amount of projects applied to the main international funding programmes and gained by the centre, as partners and as coordinators, during the last 5 years, was measured; and the figures of competitive funds applied and got by the institution, both national and international scope. To complete the figures for each participating R&D Area, we also analysed the volume of funding in euro and as percentage for both national and international funding programmes. The number of indexed publications in JCR during the last 5 years, indicating the approximate number of publications per year, was also codified using numeric variables. In part two of the questionnaire respondents were asked to assess their Research Area members' composition, and the demographic characteristics of the work teams. For this purpose, multiple items to collect the R&D group demographic characteristics variable were considered, like ages, sex, nationality, educational background, research specialties within the group, tenure in the centre, type of labour relationship, experience in the job, professional training, etc. We used nominal, ordinal and numerical variables to collect this data.

The questionnaire addressed to Research Area Directors comprises five different parts. In the first part, respondents were asked about the type of activities performed within the Research Area, in relation to the acquisition of competitive financing. For this variable, the nature of the research activities developed by the group and the actions for partner search and networking dimensions was considered. The design of the items for measure this variable was taken from data included in the annual scientific reports of most centres of our sample, since at least 80% of them included these data in their annual reports. We used a 7-items *Likert* scale from 1 to 7. In the second part of the questionnaire, the type of relations established by researchers when applying for international competitive projects, within and outside their institutions and research areas, was measured. We adapted the scale of Han and Hovav (2013) to multiple items for the variable codification, concerning to bonding or internal trust and bridging or external trust. We used 7-items *Likert* scales, from 1 "Never" to 7 "always". Part three of the questionnaire focused on the relationships between the R&D group and the CEO or TMT, ergo the support researchers perceived from their managerial structures when applying for international projects. We used a 5-items *Likert* scale, from 1 "No support" to 5 "Total support". Support received from the managerial structures, the main reasons to establish the R&D Area, the support and difficulties encountered by the Area, and **main priorities and challenges faced by the R&D Area were also independent variables** for measuring the relationships between the R&D group and the CEO or TMT. For these independent variables, we adapted the scale of Clausen et al. (2012), *Table 6. Key reasons for the establishment of each unit*; *Table 7. Barriers and support*; and *Table 12. Greatest challenges*. The scales were all modified to fit our research context. We used a 5-items *Likert* scales, from 1 "Strongly disagree" to 5 "Strongly agree". In part fourth of the survey, respondents were asked about type of incentives offered to researchers in competitive fund acquisition. We adapted the scale of Linz and Semykina (2012) and used a dichotomous scale 1: "Yes"- 2: "No". Incentives given to Researchers in relation to international competitive fund acquisition, both intrinsic and extrinsic rewards, were also measured. We adapted the scale of Linz and Semykina (2012) and appropriately modified to fit our research context, using 5-items *Likert* scales, from 1 "Not done" to 5 "Always done".

Finally, in part five of the questionnaire respondents were asked about some of their personal-professional characteristics, in order to get the Head of the Research Area demographic profile variable. We included 5 different items to assess their age, sex, background, tenure, experience in the job, professional profile, etc. We used nominal and dichotomous scale 1: "Yes"- 2: "No" to measure this data. The items constructed for the scales are presented in Table 9.

Table 9. Measures of Heads of R&D Areas Questionnaire

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Type of activities performed within the Research Area, in relation to the acquisition of competitive financing	Nature of the research activities	1.1 Basic – Applied Research	*Likert* scale from 1 (100% basic) to 7 (100% applied)
		1.2 Specialised – Multidisciplinary research	*Likert* scale from 1 (100% specialized) to 7 (100% multidisciplinary)
		1.3 Collaboration with other R&D teams of the own centre: With – Without collaboration	*Likert*scale from 1 (100% in collaboration) to 7 (100% no collaboration)
		1.4 Collaboration with other R&D teams outside the centre: National – International collaborations	*Likert* scale from 1 (100% national) to 7 (100% international)
		1.5 Collaboration with private firms and companies, and other public not R&D organizations	*Likert* scale from 1 (100% with public/private companies) to 7 (0% public/private companies)

Table 9. Measures of Heads of R&D Areas Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Type of activities performed within the Research Area, in relation to the acquisition of competitive financing	Actions for partner search and networking	1.6.1 Contact with known regional/local R&D groups	*Likert* scale from 1 (never) to 7 (always)
		1.6.2 Contact with known national R&D groups	
		1.6.3 Contact with known international R&D groups	
		1.6.4 Contact with groups through specialized Web sites for partner search	
		1.6.5 Search for potential partners at scientific events: specialized congresses, workshops, etc.	
		1.6.6 Contact with known companies	
		1.7 The Head of the Research Area can influence the decision which international calls for proposals to apply for	
		2.1.2 Contact with researcher of other R&D area of my centre	
		2.1.3 Contact with national researcher of other centres	
		2.1.4 Contact with international researcher of other centres	
		2.1.5 Contact with members of my Research Management Office	
		2.1.6 Contact with the Ministries National Contact Points (NCP) for international programmes promotion, and other personnel from the National R&D system	
		2.1.7 Contact with staff from several international projects promotion structures (e.g. EC evaluators, NCP at the EC, Policy Officers, etc.)	

Table 9. Measures of Heads of R&D Areas Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Type of activities performed within the Research Area, in relation to the acquisition of competitive financing	Relationships with researchers from the own group	2.2.1 I feel good when I depend on researchers of my R&D Area to carry out the tasks requested to research projects application	Adapted from of Han and Hovav (2013); *Likert* scale from 1 (never) to 7 (always)
		2.2.2 I think I can rely on the members of my R&D Area if I need help in the call selection and project applications	
		2.2.3 I fully trust the members of my R&D Area to autonomously handle tasks related to project application	
		2.2.4 I trust the ability of my Area researchers to successfully perform all tasks of the projects submitted	
	Relationships with researchers from other areas or other R&D centres	2.3.1 I feel good when I depend on researchers from other R&D areas or even other centres to carry out the tasks and processes related to research projects application	Adapted from of Han and Hovav (2013); *Likert*scale from 1 (never) to 7 (always)
		2.3.3 I am fully confident on researchers from other teams to independently handle tasks on competitive project application	
		2.3.4 I think I can share relevant information to prepare project proposals with researchers from other areas or R&D centres without fear of being taken advantage of me or of my work, even though they may have opportunities to do so	
		2.3.5 I believe researchers of other teams with whom we collaborate in the application for competitive projects, will always keep the commitments that may acquire with us	

Table 9. Measures of Heads of R&D Areas Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Type of activities performed within the Research Area, in relation to the acquisition of competitive financing	Relationships with personnel from the Research Management Office	2.4.1 I feel confident to leave to the Project Management Office staff my international projects application processes and their management	Adapted from of Han and Hovav (2013); *Likert*scale from 1 (never) to 7 (always)
		2.4.2 In my centre, I can rely on the appropriate project managers if I need their help in the application and management of international projects	
		2.4.3 I fully trust the professionalism of project managers and R&D administrators of my centre for applications and international project management	
		2.4.4 I think I can share relevant information to prepare applications and international project management with the research management staff of my centre without fear of being taken advantage of me or my work, even though opportunities to do so may arise	
		2.4.5 I think research managers always keep their commitments with me in international project management	
Support perceived by researchers from their managerial structures when applying for international projects (Relationships between the R&D group and the CEO or TMT)	Support perceived from the managerial structures	3.1 Do you feel the Director or TMT of the centre support your R&D Area when applying for international research projects?	*Likert* scale from 1 "No support" to 5 "Total support"
	Main reasons to establish the R&D Area	3.2.1 By initiative of one or few key individuals	Adapted from Clausen et al. (2012), *Table 6. Key reasons for the establishment of each unit*; *Likert* scales from 1 "Strongly disagree" to 5 "Strongly agree"
		3.2.2 The need to increase knowledge in this field of research	

Table 9. Measures of Heads of R&D Areas Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Support perceived by researchers from their managerial structures when applying for international projects (Relationships between the R&D group and the CEO or TMT)	Main reasons to establish the R&D Area	3.2.3 The need to cross interdisciplinary work with other R&D areas	Adapted from Clausen et al. (2012), *Table 6. Key reasons for the establishment of each unit*; *Likert* scales from 1 "Strongly disagree" to 5 "Strongly agree"
		3.2.4 To create a new academic - research programme	
		3.2.5 For political decision, not by the research - academic staff	
	Support and difficulties encountered by the Area	3.3.1 The support of the CEO/ Director has been crucial for the development of the AREA	Adapted from Clausen et al. (2012), *Table 7. Barriers and support*; *Likert scales from* 1 "Strongly disagree" to 5 "Strongly agree"
		3.3.2 Other R&D areas have supported the development of our area or group	
		3.3.3 The area would not have succeeded without the support of the political institutions	
		3.3.4 We have found great scepticism from other R&D areas within the centre	
		3.3.5 There are research groups within the centre who hardly maintain contact between them	
		3.3.6 It has been difficult to find Spanish partners or partners from our region to participate in international projects	
		3.3.7 Our centre has had serious problems with members of other centres or other entities	
Current Main Priorities and Challenges of the R&D Area (Relationships between the R&D group and the CEO or TMT)	Priorities and challenges	3.4.1 To get higher long-term financing associated to projects	Clausen et al. (2012), *Table 12. Greatest challenges*. *Likert* scale from 1 (not a priority) to 5 (crucial priority)
		3.4.2 To get more basal funds not coming from national or international projects	
		3.4.3 To increase the number of international scientific publications	
		3.4.4 To attract good researchers	
		3.4.5 To improve the international collaborations	

Table 9. Measures of Heads of R&D Areas Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Current Main Priorities and Challenges of the R&D Area (Relationships between the R&D group and the CEO or TMT)	Priorities and challenges	3.4.6 To develop a better scientific programme	Clausen et al. (2012), *Table 12. Greatest challenges*. *Likert* scale from 1 (not a priority) to 5 (crucial priority)
		3.4.7 To get more support from the CEO and TMT	
		3.4.8 To improve the scientific leadership of the R&D area	
		3.4.9 To achieve better support from the policy makers institutions	
		3.4.10 To improve the researchers employment opportunities	
		3.4.11 To increase collaborations with industry	
		3.4.12 To develop education & training programmes	
		3.4.13 To get practical and applicable results from the developed research projects	
		3.4.14 To get more support from other R&D areas	
		3.4.15 to improve the research culture of the area and the centre	
		3.4.16 To increase the support from other local or regional R&D areas	
		3.4.17 To face communication or collaboration internal problems	
Incentives Policy to researchers in order to increase the application and acquisition of international funded projects	Type of incentives provided by the institution to researchers of your R&D group during the last year	4.1.1 The Area researchers have a fixed annual budget, whether they succeed or not in competitive projects acquisition	Adapted from Linz and Semykina, 2012. Dichotomy scale 1: “Yes” - 2: “No”

Table 9. Measures of Heads of R&D Areas Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Incentives Policy to researchers in order to increase the application and acquisition of international funded projects	Type of incentives provided by the institution to researchers of your R&D group during the last year	4.1.2 My centre assigns a higher budget to my Area depending on the international projects we gain (do not consider the funds coming from projects)	Adapted from Linz and Semykina, 2012. Dichotomy scale 1: “Yes” - 2: “No”
		4.1.3 My centre provides non-cash benefits to those areas and researchers who gain more international projects (travel to congresses, courses, short stays, workshops, etc. not paid by the project funds)	
		4.1.4 My centre gives internal funding to contract research staff to those areas who get more international competitive projects (staff not paid directly by project funds)	
	Incentives given to Researchers in relation to International Competitive Fund Acquisition	4.2.1 It positively affects the salary of the researchers of the team who obtain the project	Adapted from Linz and Semykina, 2012. *Likert* scale 1 (do not occur)–5 (always occurs)
		4.2.2 It increases the promotion opportunities for the R&D team staff who acquire the project	
		4.2.3 It allows the applicant R&D team to develop things that make them feel good with themselves	
		4.2.4 It provides the project application R&D group higher safety to keep their jobs	
		4.2.5 It offers the R&D team members good opportunities to develop their skills and abilities	
		4.2.6 It provides the members of the applicant team greater freedom, in terms of time flexibility, autonomy, less supervision, etc.	

Table 9. Measures of Heads of R&D Areas Questionnaire (cont.)

VARIABLE LABEL	DIMESIONS	QUESTIONNAIRE ITEMS	SCALE
Incentives Policy to researchers in order to increase the application and acquisition of international funded projects	Incentives given to Researchers in relation to International Competitive Fund Acquisition	4.2.7 It enables the members of the project applicant team to achieve worthy objectives for them	Adapted from Linz and Semykina, 2012. *Likert* scale 1 (do not occur)–5 (always occurs)
		4.2.8 It improves the appreciation and respect applicant team researchers receive from the rest of their colleagues	
		4.2.9 It improves the recognition R&D team members receive from their superiors	
		4.2.10 It improves friendship researchers maintain with people they work with (managers, other researchers, etc.)	
Demographic characteristics of the Head of the R&D Area	Tenure	5.1 Number of years as Head of Research Area	Nominal
	Experience in similar jobs	5.2 Number of years in similar previous jobs	Nominal
	Participation in TMT	5.3 Participation in the scientific strategy of the centre?	Dichotomous scale 1: “Yes“ - 2: “No”
	Sex	Male	Nominal
		Female	
	Background; Education	Bioinformatics	Nominal
		Biology	
		Pharmacy	
		Mathematics	
		Medicine	

Source: ***Own elaboration***

5.4.2. Control Variables

In order to better capture the influence of the dimensions of Research Management Staff and R&D Work Groups on the proactivity and the efficacy of the Research centres in international competitive projects success, we controlled the variable size of the R&D centre, namely number of research staff. We included it as control variable at the centre level, since it is known or expected to affect their proactivity and efficacy, but was not included in our hypotheses.

Research on work groups suggests that different type of works may influence the group composition and its size shall also determine teams' goals, since environment significantly affects the effectiveness of the group and the optimum size will depend on the nature of the works to undertake (Lin et al. 2005). The amount of research staff participating in a project is essential for R&D groups when the institution pursues profitability (Carroll, ldab, Farahani, Lithner, Neumann, Sandhu, and Shepherd, 2010). Thus, the size of the centres, meaning the extent of the research groups and the quantity of R&D members within these institutions, is an important variable to consider here, since it may determine the amount of activities the entity is able to develop.

Considering the proactivity of the centres or the amount of applications for competitive funded projects in the international arena, the size of the centre may be determinant, since a high number of research groups with higher amount of team members may derived in more and better opportunities to apply and gain competitive funds. Thus, **the number of research staff in the centres**, who may influence the proactivity and the efficacy of the centre or their success in international competitive funds applications, was measured in terms of the amount of groups within the centres of the sample and the total number of researchers included in each group. In addition, the number of research staff in the centres may be an important variable to consider from the research management offices view point. The number of researchers in the centre may influence the workload of the Research Management Offices, since a higher amount of projects and R&D activities will imply higher workload for projects managers. Due to the increase of the quantity of task at the research management offices derived from a larger number of research staff in the centres, more complex relations between research managers and researchers may be expected, in order to cope with more activities and to achieve a qualified support service and an effective performance by the offices.

The whole review process of all questionnaires (see Annexes) allowed us to introduce the suitable modifications to ensure that most relevant aspects of the study were included in the surveys, and facilitate their understanding for not complex individual responses. In February 2015, the questionnaires were completed and ready to be sent to our first contact persons.

5.5. PROCESS OF DATA COLLECTION

With the information contained on the scientific annual reports of the institutes under study, a database was develop with the Directors/CEO, managers an investigator's names, email addresses, the name of their research groups, etc. With this information, we proceeded to the creation of specific panels by centre to address the applicable questionnaires to each individual, in order to send the links to their particular questionnaire to them through the online platform tool used for this purpose.

The data collection process started in 2015 establishing telephonic contact with the Director of each research centre, in order to inform them about the study and main objectives, to describe the support from the National public intuitions with competences in R&D policies and to ask for their collaboration. In fact, we explained that the "Spanish Challenge 2020" research project was being developed by a team of researchers from the University of Valencia, and it was supported by the ISCIII and the General Secretariat of Science, Technology and Innovation of the MINECO. We also informed them about the aim of the project: To analyse the factors that explain the effectiveness of public R&D institutions in the acquisition of biomedical research funding from international competitive calls, pointing out the novel and differential element of this research: It was going to be approached from the management and organization administration perspective, very little considered in this area of study so far. Moreover, in order for the study to be truly useful, it was essential that each centre met each and every one of the key actors, and their close collaboration with the research team to follow up the study and establishing the necessary contacts at each centre. Through this first contact, we also introduced the Directors to the surveys, and formally got in touch both with the Heads of the R&D Management Departments and the Heads of R&D Areas contact persons. Additionally, confidentiality of the study was guaranteed and the commitment of sharing the project results.

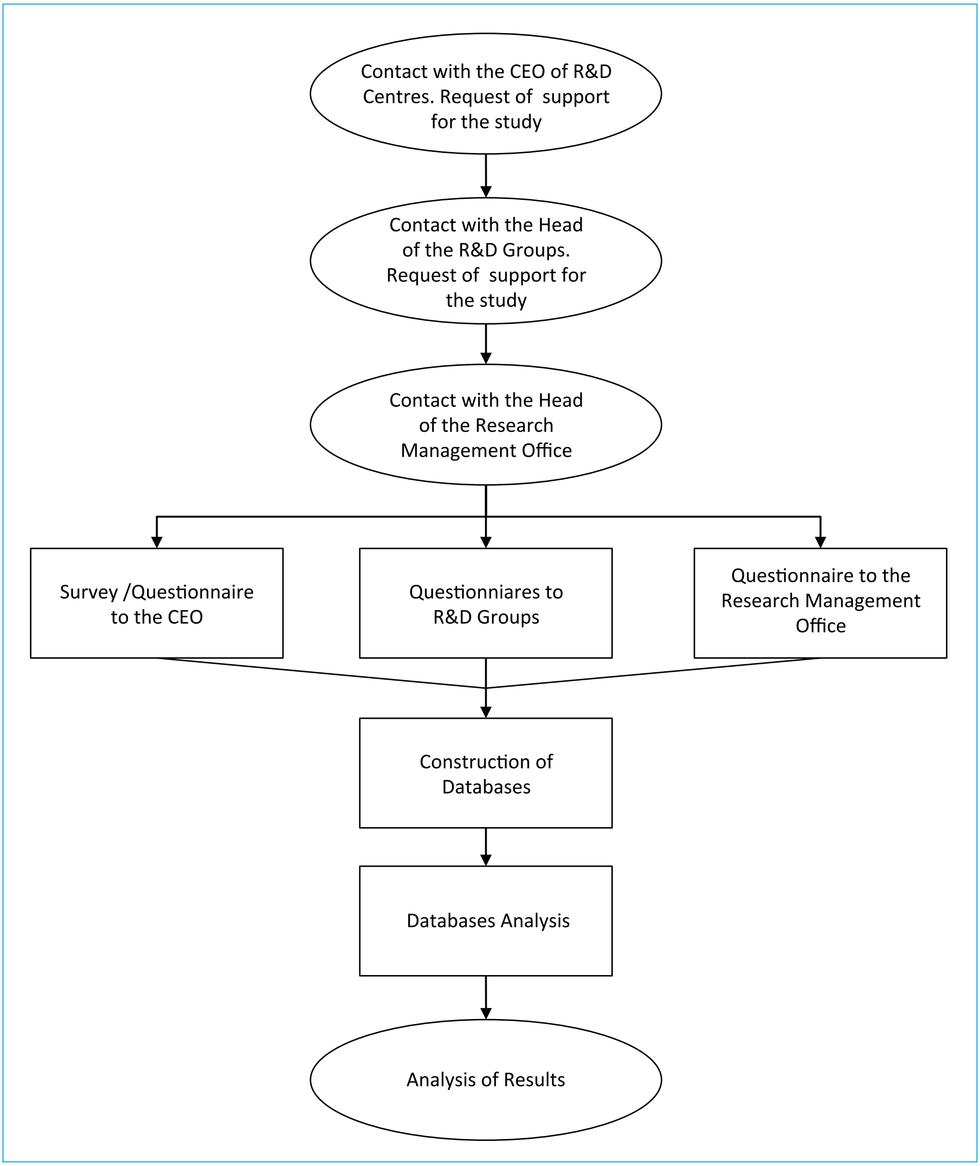
After that, an electronic mailing was sent to the Directors explaining the procedure we were going to follow up for collecting the required data of his/her institution, emphasizing the essential need to address the right actors and to fill the different types of questionnaires. General information about the entity and, most of the times, an e-mail message to the rest of key participants asking for their collaboration in the study, was obtained from the Director of each centre. Further, a visit to the centre Director for a short in-person interview to facilitate his/her particular survey was fixed when suitable, also to get additional information about R&D priorities, main R&D expected results, support to research groups, incentives policies, infrastructures, etc. We sent an electronic questionnaire survey to all CEOs or Chairpersons of the centres to gather information on their institutional characteristics. The electronic survey mode was preferred as it reduces the possibility of mistakes in the data entry procedures. Given that most of the information required in the electronic questionnaires referred to objective data, we consider it proper to have at least one respondent as a key informant in the TMT for each of the R&D Areas of the centres involved in the survey. Thus, with the awareness and support of the Director/CEO of the centre, a second electronic mailing was sent to the Heads of the R&D Areas (or the key staff proposed by the CEO), introducing the study to them, informing about the project national supports, and asking for their collaboration. Moreover, taking advantage of the visit agreed with the CEO, personnel interviews were also recommended for doubts resolve while filling the electronic questionnaire surveys. Telephonic conversations to each Head of R&D Area followed this communications, in order to explain the project and the objectives in the best possible way, and to ensure their collaboration. In this sense, and when personnel interviews with the principal investigators were not possible, the particular links to the two different questionnaires, specifically designed to be fulfilled by the Head of R&D Area, were posted by e-mail.

Following the previous contact procedure, a third electronic mailing was posted to the Project Management Office Director of each centre, asking for his/her collaboration, thereupon telephone call to clarify the topic and characteristics of the study. Telephonic conversations with the Research Management Offices ensured their collaboration and implication with the project, by means of answering their specific questionnaire and providing us with additional information about the centre and the identified R&D groups. We also suggested them to meet us during the visit to their centre. Nonetheless, when personnel meetings with these actors at those institutions were not arranged the link to their electronic questionnaire survey was addressed.

In total, we contacted 47 centres, visited and personally interviewed actors in 24 centres, and received responses with answers of all the different actors considered (CEOs, Heads of R&D Areas and Heads of Research Management Offices) from a total of 27 centres. For the 47 centres, a large and close follow up was made till all questionnaires were completed by the required actors of the study. We conducted telephone recalls and further electronic mailings to convince non-respondents to take part in the survey. Indeed, we received 34 responses from different CEOs, as well as 33 questionnaires from Heads of Research Management Offices. Regarding the Heads R&D Areas questionnaires, we received 128 responses of 36 different centres, although just 98 questionnaires came from centres with other key actors' responses. As already pointed, among the 68 centres of the total population of the study, 27 entities responded to all the electronic questionnaire surveys. This represents an overall response rate of 39,7 per cent. For each centre, we had at least one key informant among the three needed key figures we considered for the mailing.

The collection data process concluded with the construction of different databases, according to the information collected from the sources of information at the three data levels for all R&D centres: CEO/Director, R&D Areas and Research Management Offices, in regard to their general functions at their organizations, team composition and demographic characteristics, preferences, perceptions, etc. Figure 8 shows the sequential process of data collection already described.

Figure 8. The Process of Primary Data Collection



Source: ***Own elaboration***

Chapter 6

Analysis of questionnaires and results

The first section of this chapter aimed to present a descriptive analysis of the 3 questionnaires that comprise the study, by counting frequencies and percentages for categorical variables and means, standard deviations, range, etc. for quantitative variables. Secondly we made the association –correlations– between the items of the three questionnaires and the outcome variable effectiveness/productivity of international competitive research projects by the Pearson correlation coefficient, and Spearman Rho coefficient when necessary. For these analyses we used SPSS 20.0 statistical programme.

Finally, to test the model of research, we used the Partial Least Squares (PLS) technique, a method of structural equation modelling based on the variance (SEM). PLS is a technique based on a "structural equation model that focuses on maximizing the variance of the dependent variable explained by the independent variables and used to minimize the error (Wold, 1985).

On the contrary, the structural equation model based on the covariance seeks to minimize the discrepancy between the data and the theoretical hypotheses. Thus, this study uses the software SmartPLS v.2.0 (Ringle, Wende and Will, 2005) "simultaneously for the analysis of measurement model and structural model analysis. PLS is used for different reasons. First because is the most appropriate technique for forecasting purposes and development of the theory. Indeed, (Wold, 1979: 5) states that "PLS is mainly oriented to the causal predictive analysis in situations of high complexity but with some theoretical knowledge", although this technique can also be used as a confirmatory analysis (Chin, 2010). Second, it is preferable to use when the model is complex, with a large number of indicators and / or latent variables (Chin, 2010; Hair, Ringle and Sarstedt, 2011) as presented in this study, regardless of the level of theoretical context force (Chin, 2010). And thirdly, it is suitable when the sample size is limited. According to Reinartz, Haenlein and Henseler (2009: 342), "PLS should be the method of choice for all situations in which the number of observations is below 250 (400 observations in the case of models less reliable measures)", like in the case of the sample of our study.

6.1. DESCRIPTIVE STATISTICS

Tools offered by the descriptive statistics have been applied to our sample, in order to present, describe, analyse and interpret the collected data of the different surveys. We present the general trend of the sample values for the different variables, with the degree of approximation or separation that the variable values hold together in the sample.

6.1.1. CEO Questionnaire

The design of the questionnaire addressed to the Directors of the R&D centre has been already explained in previous chapters. The CEO questionnaire was divided into 5 different parts. Following the survey structure, statistics results obtained for all items are described in this section.

Part 1. Priorities for the CEO: Main objectives followed by the institution during the last 5 years in relation to research management issues.

Table 10. Priorities of CEOs and
Table 11. Values of Priorities for CEOs

1.1. TYPE OF OBJECTIVES		N	%
1.1.A To obtain funds by national and regional competitive projects	Non priority	2	7,4
	Priority	25	92,6
1.1.B To obtain funds by international competitive projects	Non priority	2	7,4
	Priority	25	92,6
1.1.C Agreements with other entities and R&D organizations	Non priority	5	18,5
	Priority	22	81,5
1.1.D Transfer of technology/ setting of Spin-Offs/transfer of licenses / patent selling	Non priority	11	40,7
	Priority	16	59,3
1.1.E To get funding by other alternative ways	Non priority	4	14,8
	Priority	23	85,2
1.1.F To increase the number of scientific publications	Non priority	2	7,4
	Priority	25	92,6
1.1.G To increase the number of divulgate publications	Non priority	19	70,4
	Priority	8	29,6
1.1.H To obtain patents	Non priority	10	37,0
	Priority	17	63,0
1.1.I To increase the number of research staff at the centre	Non priority	8	29,6
	Priority	19	70,4
1.1.J To increase the number of doctoral theses	Non priority	4	14,8
	Priority	23	85,2
1.1.K Agreements with companies/ private firms (e.g. Clinical trials, R&D service contracts, etc.)	Non priority	4	14,8
	Priority	23	85,2
1.1.L To organize scientific activities (e.g. Congresses, workshops, etc.)	Non priority	13	48,1
	Priority	14	51,9

1.2. MAXIMUM	N	%
NA	1	3,7
A	8	29,6
B	8	29,6
C	2	7,4
E	1	3,7
F	7	25,9
TOTAL	27	100

1.3. MINIMUM	N	%
NA	1	3,7
D	4	14,8
E	1	3,7
G	11	40,7
H	2	7,4
I	3	11,1
J	1	3,7
K	2	7,4
L	2	7,4
TOTAL	27	100

NR=1. No Respondents (3,7%)

Source: ***Own Elaboration***

Among the different main priorities followed by the CEOs during the last 5 years, in relation to research management issues, table 10 shows that objective A: To obtain funds by national and regional competitive projects; objective B: To increase the amount of international competitive projects; and objective F: To increase the number of indexed scientific publications, have the highest importance for Directors. In fact, for the 92,6% of the CEOs, these three objectives are crucial for their institutions. On the contrary, objective G: to increase the number of divulgate publications, has the lowest priority value, since just 29,6% of CEOs interviewed considered it as a prior objective for the centre. Table 11 presents the most and less valued priorities by the CEOs. Priority A. *To obtain funds by national and regional competitive projects* and priority B. *To obtain funds by international competitive projects* are the most valued priorities. On the contrary, priority G. *To increase the number of divulgate* (not scientific articles in JCR) *publications* was the least valued one for the 27 CEOs of the sample.

Part 2. Research staff actions in the last five years

Table 12. Type of Actions related to Recruitment of Scientific Staff

2.1. TYPE OF RECRUITMENT ACTIONS	AVERAGE *	STANDARD DEVIATIONS
2.1.1 Award of public funds by specific Human Resources competitive calls	4,0	1,2
2.1.2 Award of public funds via competitive projects funding calls in order to contract research staff	4,3	0,9
2.1.3 Award of funds from agreements signed with companies and/or other institutions to contract research personnel	3,2	1,2
2.1.4 Award of core funding from the own centre in order to contract researchers	2,6	1,8
2.2. TYPE OF SEARCHED SCIENTISTS PROFILES	**AVERAGE****	**STANDARD DEVIATIONS**
2.2.1 Search and hire researchers of very high level – Star scientist- (attraction of excellence)	3,7	1,5
2.2.2 Search and hire experimented researchers (attraction of talent)	4,0	0,9
2.2.3 Search and contract novel promising researchers (training of talent)	4,1	0,9

Table 12. Type of Actions related to Recruitment of Scientific Staff (cont.)

2.3. TYPE OF ACTIONS TO PUBLISH JOBS OFFERS	AVERAGE**	STANDARD DEVIATIONS
2.3.1 Publication on the Website of the centre	4,6	0,8
2.3.2 Diffusion and sending of offers to other centres and institutions, and to known work networks	3,4	1,6
2.3.3 Publication of offers on the official national and regional media (Official State Bulleting, etc.)	2,2	2,0

**Likert scale 0 (None)-5 (very high)*
*** Likert scale 0 (Not considered)-5 (crucial)*

Source: *Own elaboration*

Part 2 of the survey was focused in the general recruitment policies applied by the centres, in order to employ their research staff teams. Table 12 presents that the most common type of funding actions developed by the CEOS to contract scientists, comes from public funds gained through competitive R&D projects (average of 4,3), and the least followed strategy is to contract researches using their own –core or basal- funds (2,6 average). In addition, the least demanded researchers profile is the star or excellent scientists (3,7 average). Finally, new job demands for employ people are made by competitive calls, but they are mainly published via the Website pages of their own centres (4,5 average).

Part 3. Incentives policy followed by the institution to boost the application and acquisition of international funded projects

Table 13. Incentives Provided by the Institution in regard to Motivate and Promote International Research Projects Application and their Success

3.1. TYPE OF INCENTIVES	AVERAGE	STANDARD DEVIATIONS
3.1.1 It positively affects the salary of the research team who obtain the project	1,9	1,6
3.1.2 It positively affects the salary of ALL staff of the centre, even though not pertaining to the research group who get the international project	1,3	1,5

Table 13. Incentives provided by the Institution in regard to Motivate and Promote International Research Projects Application and their Success (cont.)

3.1. TYPE OF INCENTIVES	AVERAGE	STANDARD DEVIATIONS
3.1.3 It provides the project application group's higher safety to keep their jobs	3,2	1,6
3.1.4 It increases the promotion opportunities for the R&D team who acquire the project	2,5	1,4
3.1.5 It improves the appreciation and respect applicant team researchers receive from the rest of their centre staff	3,6	1,2
3.1.6 It improves the recognition team members receive from their superiors	3,7	1,3
3.1.7 It provides the members of the applicant team greater freedom, in terms of time flexibility, autonomy, less supervision, etc.	1,5	1,4
3.1.8 It enables the members of the project applicant team to achieve objectives which are worthy for them	3,6	1,6
3.1.9 It opens opportunities for the applicant team members to learn new techniques or things	3,9	1,2
3.1.10 It allows the applicant R&D team members to develop things that make them feel good with themselves	3,7	1,1
3.1.11 It offers to the team members good opportunities to develop their skills and abilities	3,9	1,2

Likert scale 1 (Does not occur) -5 (always occur)

Source: ***Own elaboration***

Table 13 presents the potential incentives to researchers that were asked in part 3 of the questionnaire, both extrinsic and extrinsic rewards, which may be followed by the CEO and their institutions to promote international projects. Results show that extrinsic rewards (question 3.1.1. regarding increases of salary of the R&D team who obtain international projects, with 1,9 average; and question 3.1.2. about increases of salary of all personnel, with 1,3 average) hardly exit in our sample. The intrinsic reward of achieving more freedom (like flexibility, autonomy and less supervision) at the work place, included in item 3.1.7, obtained a poor 1,5 average too.

Part 4. Decision-making processes when applying to international competitive projects

Table 14. Managerial Structures to Promote and Support International Projects

4.1. TYPE OF MANAGERIAL STRUCTURES		N	%
4.1.1 Strategic Unit or Department of International Projects, specifically created to boost the participation in international competitive programmes (UEPI)	Do not Exist	12	44,4
	Exist	15	55,6
4.1.2 Director of International Programmes, responsible of the dymanization and improvement of the centre participation in international competitive programmes (DPI)	Do not Exist	18	66,7
	Exist	9	33,3
4.1.3 Unit or Project Management Office of the centre (information, application, justification) (OGPI)	Do not Exist	7	25,9
	Exist	20	74,1
4.1.4 Unit or Office of Technology Transfer of research results (TTO)	Do not Exist	7	25,9
	Exist	20	74,1
4.1.5 Integrated Project Management Unit and Technology Transfer Office (OTRIPI)	Do not Exist	23	85,2
	Exist	4	14,8
4.1.6 Research Areas, with a clearly defined responsible or coordinator (AR)	Do not Exist	5	18,5
	Exist	22	81,5

Source: *Own elaboration*

The decision process, about which competitive calls the entity will apply for at the international arena, may be done at different managerial levels within each R&D centre. Table 14 shows the type of managerial structures R&D centres may have to boost international projects successful acquisition, and the degree of influence this units or departments may have in this process. Indeed, the Heads of the R&D Areas are the most clear and defined units at the centres of our sample, with the 81,5%. Less than 75% of them do not differentiate the Research Management Department and the TTOs; and only 55,6% of the centres have an independent professionalized international projects department. These results may imply a low professionalization of the offices (generalist portfolio of services offered to R&D staff), which tend to be little specialized due to the high amount of research management and transfer of technology general tasks they have to deal with.

Table 15. Influence of these Departments in Call Selection and Proposals Application Decision to International Competitive Grants

4.2. INFLUENCE IN THE DECISION-MAKING PROCESS	AVERAGE	STANDARD DEVIATIONS
4.2.1 Influence of the Strategic Unit or Department of International Projects (UEPI)	1,0	1,1
4.2.2 Influence of the Director of International Programmes (DPI)	0,7	1,1
4.2.3 Influence of the Unit or Project Management Office of the centre (OGPI)	1,4	1,1
4.2.4 Influence of the Unit or Office of Technology Transfer of research results (TTO)	0,8	0,9
4.2.5 Influence of the Integrated Project Management Unit and Technology Transfer Office (OTRIPI)	0,3	0,7
4.2.6 Influence of the Research Areas Responsible (AR)	2,0	1,4
4.2.7 Influence of the Managerial structures or TMT of the centre (TMT)	1,9	1,3
4.2.8 Influence of the CEO or Director of the centre (CEO)	1,8	1,2
4.2.9 Influence of Principal Investigators (PI)	3,7	0,5

Likert scale 0 (None) -4 (maximum influence)

Source: ***Own elaboration***

In regards to the role these specialized units, departments or key actors may play when searching and applying to international competitive programmes, all of them have shown poor influence in this process, but the Principal Investigators, who have the highest influence (3,7 average) among the rest of structures.

Part 5. Demographic characteristics of the CEO

Table 16. Characteristics of the CEO

SEX	N	%
Male	21	77,8
Female	6	22,2
Total	27	100
BACKGROUND	N	%
Bachelor	3	11,1
PhD	24	88,9
Total	27	100
ACADEMIC DEGREE	N	%
Biology	6	22,2
Business/Economy	2	7,4
Pharmacy	4	14,8
Telecommunications Eng.	1	3,7
Medicine	13	48,1
Chemistry	1	3,7
Total	27	100

Source: ***Own elaboration***

Table 17.Socio-demographic Characteristics of the CEO

AGE	N	MINIMUM	MAXIMUM	AVERAGE	STANDARD DEVIATIONS
	27	45	73	57,4	7,0
TENURE/EXPERIENCE	N	MINIMUM	MAXIMUM	AVERAGE	STANDARD DEVIATIONS
	27	1	13	4,6	3,0

Source: ***Own elaboration***

Table 16 shows that 77,8% of the CEOs are male, almost 90% have PhD studies, and most of them have a Biomedicine and/or Health academic background (mainly physicians). In addition, table 17 shows results about the age of the CEOs, in average 57 years old, with an average tenure in their jobs of nearly 5 years.

6.1.2. Head of Research Management Office Questionnaire

Questionnaire design addressed to the responsible person of the Research or Project Management Offices of our sample have been previously explained. The survey was divided into 4 differentiated sections. Following this structure, statistical results obtained for all their items are now described.

Part 1. Activities developed by the Research Management Office

Table 18.Type of Activities and Tasks Undertaken in the last year

1.1. ACTIVITIES	AVERAGE	STANDARD DEVIATIONS
1.1.1 Amount of international competitive projects managed	2,6	1,6
1.1.2 Applied projects to international competitive programmes	2,8	1,8
1.1.3 Transfer of technology: Number of patents managed	1,3	1,3
1.1.4 R&D international agreements managed	1,5	1,5
1.1.5 Number of agreements managed and funded by international competitive calls, to incorporate personnel	1,6	1,4
1.1.6 Spin-Offs settled from conducted R&D activities	0,4	0,5

Likert scale 1 (None)-5 (> 35)

Source: ***Own elaboration***

Among the different activities which can be usually implemented within a research management office, the highest amount of tasks are related to the application and management of international competitive funded projects, with an average of 2,8 and 2,6 respectively. This means the offices of our sample managed an average of 11 to 20 international projects per year.

Table 19. International Projects Applied and
Table 20. International Projects Applied as Coordinators

1.2.	AVERAGE*	STANDARD DEVIATIONS
1.2 International competitive projects applied by the centre	2,7	1,8
1.2 Number	55,9	39,3

1.3.	AVERAGE**	STANDARD DEVIATIONS
1.3 International competitive projects applied by the centre as coordinators	1,9	1,6
1.3 Number	20,6	17,7

** Likert scale 0 (None)-5 (>100)*
*** Likert scale 0 (None)-5 (>50)*

Source: ***Own elaboration***

Attending to the number of international projects managed by the research management offices in the last five years, table 19 shows an average of 54 projects proposals applications, since the institutions have on average between 41 and 60 projects proposals. In addition, 20 of project applications made by researchers in the last 5 years were presented with the role of project coordinators, meaning principal project investigators leaded in average between 11 to 24 proposals within an international partnership consortium.

Table 21. International Projects Gained last 5 years and
Table 22. Projects Gained as Coordinators

1.4.	AVERAGE*	STANDARD DEVIATIONS
1.4 International competitive projects gained by the centre	2,1	1,1
1.4 Number	20,6	11

1.5.	AVERAGE**	STANDARD DEVIATIONS
1.5 International competitive projects gained by the centre as coordinators	1,1	1,2
1.5 Number	7,9	8,9

** Likert scale 0 (None)-4 (>36)*
*** Likert scale 0 (None) -4 (>26)*

Source: ***Own elaboration***

Table 21 and table 22 present results of projects gained by the entities of our sample in the last 5 years, with a success average of 20 international projects. Besides, the average of international projects acquired or won as coordinators was near 8 projects.

Table 23. Total Competitive Funds Applied and Table 24. Total Funds Gained

1.6.	AVERAGE*
1.6.1 Total funding requested of international competitive projects	3,7
1.6.1 Amount	13.403.961,40 €
1.6.2 Total funding requested of international competitive projects as coordinators	2,8
1.6.2 Amount	9.807.769,20 €

1.7.	AVERAGE**
1.7.1Total funding gained by international competitive projects	3,6
1.7.1 Amount	6.074.148,10 €
1.7.2 Total funding gained by international competitive projects as coordinators	2,2
1.7.2 Amount	3.925.999,90 €

** Likert scale 0 (0 €)-6 (>25 M€)*
*** Likert scale 0 (0 €)-6 (>12 M€)*

Source: ***Own elaboration***

Tables 23 and 24 present the competitive funds gained by the 27 centres from international agencies in the last 5 years. The average of total competitive funding applied was higher than 13M €. Almost 10M € were applied to international funding programmes as project coordinators. The global international funds gained were higher than 6M €. Table 24 also shows the average amount of funds obtained by the centres in the last 5 years as project coordinators, close to 4M €.

Table 25. International Projects Applied and Gained in the last 5 years by main Funding Programme

1.8. INTERNATIONAL PROGRAMMES APPLIED	AVERAGE*	STANDARD DEVIATIONS
1.8.1 7th FP- Cooperation - Health	3,2	1,4
1.8.2 7th FP- Cooperation - BIO	1,5	0,8
1.8.3 7th FP- Cooperation - TIC	2,0	1,2
1.8.4 7th FP- Cooperation - Environment	1,4	0,9
1.8.5 7th FP- Cooperation -NANO	1,3	0,8
1.8.6 7th FP- IDEAS (ERC)	2,4	1,2
1.8.7 7th FP- PEOPLE	2,8	1,3
1.8.8 7th FP- Infrastructures	1,3	0,4
1.8.9 7th FP- Large Initiatives	1,5	0,7
1.8.10 DG ENVIRONMENT - LIFE+ Programme	1,5	0,7
1.8.11 DG SANCO Health Programme	1,5	0,7
1.8.12 DG JUSTICE - DAPHNE Programme	1,2	0,4
1.8.13 European Social & Cohesion. Programme-FEDER Funds	1,5	0,9
1.8.14 7th FP - CIP	1,3	0,6
1.8.15 National Institute of Health, USA (NIH)	2,0	1,0
1.9. INTERNATIONAL PROGRAMMES GAINED	**AVERAGE****	**STANDARD DEVIATIONS**
1.9.1 7th FP- Cooperation - Health	2,6	1,1
1.9.2 7th FP- Cooperation - BIO	1,2	0,4
1.9.3 7th FP- Cooperation - TIC	1,4	0,8
1.9.4 7th FP- Cooperation - Environment	1,3	0,6
1.9.5 7th FP- Cooperation - NANO	1,2	0,5
1.9.6 7th FP- IDEAS (ERC)	1,4	0,6
1.9.7 7th FP- PEOPLE	2,2	1,1
1.9.8 7th FP- Infrastructures	1,2	0,4
1.9.9 7th FP- Large Initiatives	1,2	0,4
1.9.10 DG ENVIRONMENT - LIFE+ Programme	1,3	0,5
1.9.11 DG SANCO Health Programme	1,5	0,8
1.9.12 DG JUSTICE - DAPHNE Programme	1,0	0,2
1.9.13 European Social & Cohesion. Programme-FEDER Funds	1,4	0,7
1.9.14 7th FP - CIP	1,2	0,4
1.9.15 National Institute of Health, USA (NIH)	1,5	0,8

** Likert scale 1 (Never applied) -5 (≥20 applications)*
*** Likert scale 1 (Never gained)-5 (>10 projects won)*

Source: ***Own elaboration***

Attending to the diverse international agencies and different programmes to apply for competitive funds, the 7th Framework Programme of the DG Research an Innovation of the EC, in particular: Cooperation Programme – Biomedicine and Health Thematic Area, People Programme (Marie Curie Actions), IDEAS Programme from the European Research Council (ERC), had the highest average values: 3,3; 2,4 and 2,8 respectively. In regard to the acquisition of projects by main funding programmes, and also within the 7th Framework Programme of the EC, the Cooperation Programme – Biomedicine and Health Thematic Area (2,6 average), and the People Programme (Marie Curie Actions) with an average of 2,3 were the most successful ones. The ERC IDEAS programme, for excellent most basic research projects within H2020, just got 1,3 on average.

Table 26. Main Services provided to R&D Groups to Apply and Manage International Projects

1.10. TASKS AND ACTIVITIES	AVERAGE	STANDARD DEVIATIONS
1.10.1 Dissemination of information to researchers about international competitive calls and programmes	2,0	0,6
1.10.2 To provide researchers with all documentation associated to each competitive call	1,9	0,8
1.10.3 Management of applications	1,8	1,0
1.10.4 Project proposal applications follow up: from pre-award decision resolutions to formal acceptance of the grant.	1,8	1,0
1.10.5 Economic justifications of projects	2,2	0,8
1.10.6 Budget preparation of project proposals	1,5	1,1
1.10.7 Collaboration in the preparation of the scientific & technical reports	0,9	1,0
1.10.8 Organization of seminars and training courses to researchers on project management	1,2	1,0
1.10.9 Communication and interaction with R&D groups to assess the application of new competitive projects	1,3	1,2
1.10.10 Management of Human Resources assigned to the project	1,9	1,0

Likert scale 0 (No service)-3 (Personalized service protocol)

Source: ***Own elaboration***

Diverse types of activities may be developed by the research management offices of each R&D institution to promote and support researchers when they tend to apply and acquire international projects. The services provided to the research teams may be part of the usual tasks of these offices, but they may be more or less ample, varied, frequent, specialised, and adapted –personalised– to the specific need of the different groups. Table 26 presents that activity 1.10.1. “Dissemination about open international calls and programmes”, with average 2,0 and activity 1.10.5 “Economic justification of projects” (2,2 average) are the most intense services offered to R&D teams by the research managers. These results show that research management offices are mainly involved in economic justification activities –phase of projects execution– and general information about open calls (e.g. through newsletters), but they face a clear lack of personal interaction with researchers and provide poor personalised services to promote applications and support projects technical justifications. Most of the tasks focused on specific applications, project follow-up and management training to researchers obtained a low average rate (less than 2), since they are almost not done or just done on demand.

Table 27. Structures within the Office to Support International Projects Applications

1.10. TYPE OF MANAGING STRUCTURES		N	%
1.10.11 The Office has clearly identified managers or specialist advisors for each competitive funding programme	Do not exist	18	67
	Exist	9	33
1.10.12 The office has clearly identified managers or advisors in each R&D group	Do not exist	23	85
	Exist	4	15
1.10.13 The Head of the R&D Management Office is part of the TMT of the centre	Do not exist	13	48
	Exist	14	52
1.10.14 The Head of the R&D Management Office participates in the decision making process of which international competitive calls the centre may apply for	Do not exist	17	63
	Exist	10	37

Source: ***Own elaboration***

In table 27 it can be observed that almost half of the Directors of the Research Management Offices are members of the TMT of their institutions, but not all of them (63% do not exist) are allowed to participate in decisions about international competitive calls selection to apply for. Further, the centres do not have individual research managers specialised in the main funding programme (67% do not exist). In addition, the centres of our sample do not have research managers integrated in the main R&D Areas to support them in a more focused and particular way (85% do not exist). These results are aligned with the ones regarding services provided to R&D groups when applying and managing international projects showed in table 23, also evincing a lack of competence and professionalization of the offices, in terms of specialised services and structural characteristics to support acquisition and international project management to the R&D groups.

Part 2. Policies oriented to increase the application and acquisition of international competitive funds

Table 28. Incentives to Research Managers when Gaining International Competitive Projects

2.1. TYPE OF INCENTIVES/EFFECTS	AVERAGE	STANDARD DEVIATIONS
2.1.1 It positively affects the salary of the members of the Research Management Office	1,5	1,2
2.1.2 It positively affects the salary of ALL researchers of the centre, even though not pertaining to the group who get the international project	1,4	0,7
2.1.3 It provides the members of the Office higher safety to keep their jobs	2,1	1,3
2.1.4 It increases the promotion opportunities for the members of the Research Management Office	1,6	1,1
2.1.5 It improves the appreciation and respect members of the Office receive from the rest of the centre staff	2,4	1,2
2.1.6 It improves the recognition the Office members receive from their superior	2,7	1,3
2.1.7 It provides the members of the Office greater freedom, in terms of time flexibility, autonomy, less supervision, etc.	1,5	1,1
2.1.8 It enables the members of the Office to reach objectives which are worthy for them	2,7	1,5
2.1.9 It offers opportunities for the Office members to learn new things	3,7	1,1
2.1.10 It allows the Office members to develop things that make them feel good with themselves	3,3	1,3
2.1.11 It offers the Office members good opportunities to develop their skills and abilities	3,6	1,1

Likert scale 1 (Do not occur)-5 (always occurs)

Source: ***Own elaboration***

With regard to motivate and promote international competitive research success rates, table 28 presents potential and different incentives which may be offered by the centre to the research managers, both intrinsic and extrinsic rewards, when acquiring competitive projects. Results show that extrinsic rewards (question 2.1.1. regarding increases of salary of the office staff when international projects are acquired by any R&D area, with 1,5 average; and question 2.1.1. about increases of salary of all personnel, with 1,4 average) almost do not exit. The intrinsic reward of achieving higher freedom (more flexibility, autonomy, less supervision, etc.) for research managers at their centres, included in question 2.1.7, obtained a low 1,5 average too. These results are similar to the ones obtained in part 3 of the questionnaire addressed to the CEOs, regarding incentives policy promoted within the centres.

Part 3. Research Management Office composition and the demographic characteristics of its staff members

Table 29. Composition of the Research Management Office

3.1.	AVERAGE	STANDARD DEVIATIONS
3.1.1 Total number of members of the Research Management Office	9,3	6,8
3.1.2 How many of them develop project management functions?	4,2	4,3
3.1.3 How many are women?	5,2	4,7
3.1.4 How many of them had previously worked in similar positions at other R&D centres?	2,9	3,2
3.1.5 How many of them have worked or work as researchers in addition to their current project management role?	1,1	1,4
3.1.6 How many of them are fluent in English language?	3,1	2,5
3.1.7 How many of them are civil servants or have permanent contracts?	4,0	3,6
3.1.8 How many of them are doctors or are doing a PhD?	1,2	1,2
3.1.9 How many of them are from other nationalities to the Spanish?	0,3	0,7
3.1.10 How many of them are members of Research Managers Associations (e.g. ARMA, REGIC…)	1,2	2,8

Source: ***Own elaboration***

Results included in table 29 show that research management offices have 9 members on average (9,3). More than a half of its members are women (5,3 average), and almost more of the staff them are civil servants (permanent contracts).

Table 30. Socio-demographic Characteristics of the Office Staff: Number of Members of the Research Management Office

3.2. TENURE; EXPERIENCE IN THE JOB	AVERAGE	STANDARD DEVIATIONS
3.2.1 < 2 years	1,5	0,8
3.2.2 2-4 years	2,6	1,0
3.2.3 5-6 years	3,3	0,5
3.2.4 > 6 years	4,2	0,6
3.3. ACADEMIC DEGREES (NO OF MEMBERS)	**AVERAGE**	**STANDARD DEVIATIONS**
3.3.1 Business Administration/ Economy	1,8	2,5
3.3.2 Other Social Sciences: Law, Labour Relations, Work Sciences, etc.	1,4	1,7
3.3.3 Engineers	0,5	1,1
3.3.4 Basic Sciences: Chemistry, Physics, Mathematics, etc.	1,0	1,5
3.3.5 Health Sciences: Pharmacy, Biology, Veterinary, Medicine, etc.	2,5	2,4
3.3.6 Project management or research management university postgraduate studies	0,9	1,2
3.3.7 Training in international R&D project management (at least 8 hours courses)	2,9	3,2
3.4. BACKGROUND /EDUCATION	**AVERAGE**	**STANDARD DEVIATIONS**
3.4.1 PHD Studies	1,6	1,4
3.4.2 Bachelor	3,9	3,9
3.4.3 Graduated /University degree	0,6	0,8
3.4.4 Professional superior degree/ High school	2,8	2,8
3.5. AGE (NUMBER OF MEMBERS)	**AVERAGE**	**STANDARD DEVIATIONS**
3.5.1 < 30 years old	1,8	2,1
3.5.2 (30-40) years old	2,8	3,6
3.5.3 (41-50) years old	1,8	2,1
3.5.4 (51-60) years old	1,2	1,8
3.5.5 (>60) years old	1,0	1,7

Source: ***Own elaboration***

Table 30 presents the tenure of the office members, with an experience in their jobs longer than 6 years, on average 4,2. Besides, most of the academic degrees of the staff are related to Biomedicine a Health studies (2,6 average), but they do not have specific (formal) education in project management (2,9 on average do not have official studies). Most of the members of these offices are bachelors (3,9 average), and the average age of the staff is between 30 to 40 years old.

Part 4. Demographic characteristics of the Head of the Research Management Office

Table 31. Academic Degree and Table 32. Academic Degree and Background

	N	%
NA	4	14,8
Law	3	11,1
Documentation	1	3,7
Business/Economy	5	18,5
Pharmacy	5	18,5
Physics	1	3,7
Telecommunications Eng.	1	3,7
English Philology	1	3,7
Philosophy	1	3,7
Medicine	2	7,4
Chemistry	3	11,1
TOTAL	27	100
NA= 4. No Answer (14,8 %)		

ACADEMIC DEGREE	N	%
NA	4	14,8
Health Sciences	10	37,0
Non Health Sciences	13	48,2
TOTAL	27	100

BACKGROUND	N	%
NA	2	7,4
Graduated	1	3,7
PhD	10	37
Bachelor	14	51,9
TOTAL	27	100
NA= 4. No Answer 14,8 %)		
NA= 2. No Answer (7,4 %)		

Source: ***Own elaboration***

In regards to the Heads or Directors of the Research Management Offices education, table 31 and 32 show that 51,9% of them are bachelor and 37% have PhD studies. Attending their academic degree, only 37% have a Biomedicine and/or Health related academic background.

Table 33. Sex and Table 34. Age and Tenure in the Job

	N	%
NA	2	7,4
Female	18	66,7
Male	7	25,9
TOTAL	27	100

AGE	N	MINIMUM	MAXIMUM	AVERAGE	STANDARD DEVIATIONS
4.1.3 Age	25	34	64	46,7	9,2
TENURE	N	MINIMUM	MAXIMUM	AVERAGE	STANDARD DEVIATIONS
Tenure in the Centre	25	1	35	10,3	10,5
Tenure in current job	25	1	12	4,9	2,9

NA= 2. No Answer (7,4 %)

Source: ***Own elaboration***

Table 33 presents that 66,7% of the directors are female. Table 34 shows an average age of 46 years old, and an average tenure in their current jobs close to 5 years (between 1 and 12 years), and an average job experience of 10 years (from 1 to 35 years) at their institutions.

Table 35. Type of Labour Contract and Table 36. English Language Level

	N	%
NA	2	7,4
Civil Servant	11	40,7
Permanent Staff	11	40,7
Labour contract	3	11,1
TOTAL	27	100

NA= 2. No Answer (7,4 %)

	N	%
Low	2	7,4
Medium	6	22,3
High	16	59,2
NA	3	11,1
TOTAL	27	100

NA= 3. No Answer (11,1 %)

Source: ***Own elaboration***

Results about the type of contracts summarized in table 35 show that most of the directors have a permanent job (civil servant or permanent contracts). In regards to languages skills, more than a half of the directors of our sample have high English language level (table 36 with 59,2%), but low to medium French language level, and almost none of them have other language knowledge (table 37).

Table 37. French Language and other Languages Level

FRENCH LANGUAGE LEVEL	N	%
Low	8	29,6
Medium	6	22,3
High	4	14,8
NA	9	33,3
TOTAL	27	100
OTHER LANGUAGES LEVEL	**N**	**%**
NA	24	88,8
German	1	3,7
German & Portuguese	1	3,7
Italian	1	3,7
TOTAL	27	100

NA= 9. No Answer (33,3 %); NA=24. No Answer (88,8 %)

Source: ***Own elaboration***

6.1.3. *Head of R&D Area Questionnaire*

The questionnaire structure and design posted to the Heads of the R&D Areas and research teams of the centres were described in previous chapters. As for the other 2 surveys, this questionnaire was divided in differentiated parts. Following the survey structure, results of all questions included in the 5 sections, are now described.

Part 1. Type of activities performed within the Research Area, in relation to the acquisition of competitive financing (group proactivity)

Table 38. Nature of the Works Developed within the R&D Groups; Partner Search and Networking Activities Developed by the R&D Groups when Applying for Competitive Projects

1. NATURE OF THE RESEARCH ACTIVITIES	AVERAGE	STANDARD DEVIATIONS
1.1 Basic – Applied Research	3,8 [a]	2
1.2 Specialised – Multidisciplinary research	3,7 [b]	1,8
1.3 Collaboration with other R&D teams of the own centre: With – Without collaboration	4,3 [c]	1,8
1.4 Collaboration with other R&D teams outside the centre: National – International collaborations	3,5 [d]	1,5
1.5 Collaboration with private firms and companies, and other public not R&D organizations	5,6 [e]	1,3
1. ACTIONS FOR PARTNER SEARCH AND NETWORKING	**AVERAGE***	**STANDARD DEVIATIONS**
1.6.1 Contact with known regional/local R&D groups	3,9	1,4
1.6.2 Contact with known national R&D groups	4,6	1,2
1.6.3 Contact with known international R&D groups	4,8	1,4
1.6.4 Contact with groups through specialized Web sites for partner search	2,0	1,0
1.6.5 Search for potential partners at scientific events: specialized congresses, workshops, etc.	4,2	1,4
1.6.6 Contact with known companies	2,8	1,5
1.7 The Head of the Research Area can influence the decision which international calls for proposals to apply for	3,7	2,2

[a]*Likert scale 1 (100% basic)-7 (100% applied)*
[b]*Likert scale 1 (100% specialized)-7 (100% multidisciplinary)*
[c]*Likert scale 1 (100% in collaboration)-7 (100% no collaboration)*
[d]*Likert scale 1 (100% national)-7 (100% international)*
[e]*Likert scale 1 (100% with public/private companies)-7 (0% with public/private companies)*
**Likert scale 1 (never)-7 (always)*

Source: ***Own elaboration***

Attending to the nature of the research works developed by the R&D groups, most of their research is basic and specialised. The research teams do not fully collaborate with other R&D groups (4,3 average, and cooperation is done more with national teams than with international ones. Further, only 20% of the collaborations with other research teams come from the industry (either private or public). In addition, table 38 also shows the different actions done by the group when looking for partners to build international consortiums. Results show that R&D teams use to get more in contact with international R&D known teams (4,8 average), but hardly use specialized Web sites for partner search or establish contact with the industry. Regarding the extent the Head of the Research Area can influence the decision which international calls for proposals to apply for, they decide just sometimes to few times (average value of 3,7).

Part 2. Relations established by researchers within and outside their institutions when applying for competitive granted projects

Table 39. Types of Relations Established by Researchers when Applying for International Competitive Projects

2.1. RELATIONS WITH OTHER RESEARCHERS AND GROUPS	AVERAGE	STANDARD DEVIATIONS
2.1.1 Contact with researcher of my own R&D area	5,2	1,4
2.1.2 Contact with researcher of other R&D area of my centre	3,6	1,3
2.1.3 Contact with national researcher of other centres	4,4	1,3
2.1.4 Contact with international researcher of other centres	4,8	1,6
2.1.5 Contact with members of my Research Management Office	4,5	2,3
2.1.6 Contact with the Ministries National Contact Points (NCP) for international programmes promotion, and other personnel from the National R&D system	3,6	1,8
2.1.7 Contact with staff from several international projects promotion structures (e.g. EC evaluators, NCP at the EC, Policy Officers, etc.)	3,0	1,6

Table 39. Types of Relations Established by Researchers when Applying for International Competitive Projects (cont.)

2.2. RELATIONSHIPS WITH RESEARCHERS FROM THE OWN GROUP	AVERAGE	STANDARD DEVIATIONS
2.2.1 I feel good when I depend on researchers of my R&D Area to carry out the tasks requested to research projects application	5,1	1,6
2.2.2 I think I can rely on the members of my R&D Area if I need help in the call selection and project applications	5,1	1,6
2.2.3 I fully trust the members of my R&D Area to autonomously handle tasks related to project application	5,1	1,7
2.2.4 I trust the ability of my Area researchers to successfully perform all tasks of the projects submitted	5,7	1,4
2.3. RELATIONSHIPS WITH RESEARCHERS FROM OTHER AREAS OR OTHER R&D CENTRES	**AVERAGE**	**STANDARD DEVIATIONS**
2.3.1 I feel good when I depend on researchers from other R&D areas or even other centres to carry out the tasks and processes related to research projects application	4,6	1,5
2.3.2 I think I can rely on researchers from other R&D teams if I need help in calls selection project applications	4,5	1,5
2.3.3 I am fully confident on researchers from other teams to independently handle tasks on competitive project application	4,8	1,4
2.3.4 I think I can share relevant information to prepare project proposals with researchers from other areas or R&D centres without fear of being taken advantage of me or of my work, even though they may have opportunities to do so	5,0	1,5
2.3.5 I believe researchers of other teams with whom we collaborate in the application for competitive projects, will always keep the commitments that may acquire with us	5,1	1,3
2.4. RELATIONSHIPS WITH PERSONNEL FROM THE RESEARCH MANAGEMENT OFFICE	**AVERAGE**	**STANDARD DEVIATIONS**
2.4.1 I feel confident to leave to the Project Management Office staff my international projects application processes and their management	4,7	2,1

Table 39. Types of Relations Established by Researchers when Applying for International Competitive Projects (cont.)

2.4.2 In my centre, I can rely on the appropriate project managers if I need their help in the application and management of international projects	4,5	2,1
2.4.3 I fully trust the professionalism of project managers and R&D administrators of my centre for applications and international project management	4,7	2,0
2.4.4 I think I can share relevant information to prepare applications and international project management with the research management staff of my centre without fear of being taken advantage of me or my work, even though opportunities to do so may arise	5,8	1,6
2.4.5 I think research managers always keep their commitments with me in international project management	5,6	1,7

Likert scale 1 (never)–7 (always)

Source: ***Own elaboration***

Table 39 offers global results of the diverse actions undertaken by the R&D teams to collaborate with other research teams, in order to apply and acquire international projects. We see that researchers do not use to contact with colleagues from other areas of their own centre (3,6 average), and only in few occasions they get in touch with the National Contact Points in charge of European affairs at the Spanish Ministries, or with the policy officers of the funding programmes in the European Commission and its executive agencies (3,6 and 3,0 average). Nevertheless, researchers do contact many times with colleagues from their own R&D areas or group (all average values are higher than 5). Further, they tend to trust and value those researchers they collaborate with, even if they do not belong to their own group (average value equal or very close to 5 in all items of question 2.3). In addition, R&D team members have good relationships with the personnel of the research management office of their centres when applying to international projects. In fact, they value the research managers' professionalism and adequacy to their job. Many times researchers feel they can trust relevant –confidential– information with their research managers, and they do worth the compromises managers get with them when dealing with competitive projects (average of 5,8 and 5,6).

Part 3. Relationships between the R&D group and the CEO or TMT

Table 40. Support Perceived by Researchers when Applying for International Projects

3.1. SUPPORT PERCEIVED FROM THE MANAGERIAL STRUCTURES	AVERAGE*	STANDARD DEVIATIONS
3.1 Do you feel the Director or TMT of the centre support your R&D Area when applying for international research projects?	3,9	1,3
3.2. MAIN REASONS TO ESTABLISH THE R&D AREA	**AVERAGE**	**STANDARD DEVIATIONS**
3.2.1 By initiative of one or few key individuals	3,9	1,3
3.2.2 The need to increase knowledge in this field of research	3,9	1,3
3.2.3 The need to cross interdisciplinary work with other R&D areas	3,0	1,3
3.2.4 To create a new academic - research programme	3,3	1,4
3.2.5 For political decision, not by the research - academic staff	1,9	1,2
3.3. SUPPORT AND DIFFICULTIES ENCOUNTERED BY THE AREA	**AVERAGE**	**STANDARD DEVIATIONS**
3.3.1 The support of the CEO/Director has been crucial for the development of the AREA	3,4	1,3
3.3.2 Other R&D areas have supported the development of our area or group	2,8	1,2
3.3.3 The area would not have succeeded without the support of the political institutions	2,1	1,2
3.3.4 We have found great scepticism from other R&D areas within the centre	2,2	1,2
3.3.5 There are research groups within the centre who hardly maintain contact between them	3,4	1,4
3.3.6 It has been difficult to find Spanish partners or partners from our region to participate in international projects	2,8	1,3
3.3.7 Our centre has had serious problems with members of other centres or other entities	1,9	1,2

Likert scale 1 (totally agree)–5 (totally disagree)
**Likert scale 1 (no support)–5 (fully support)*

Source: ***Own elaboration***

Table 40 shows that when applying for international competitive projects, the Heads of the R&D Areas or units think they get support from the CEO or the TMT of their institutions most of the times (average of 3,9 of question 3.1). Besides, the areas where not established in their institutions because political reasons or by public policy makers (1,9 average), but due to scientific needs and by key persons involved in those fields of knowledge (average 3,9 of question 3.2). In addition, researches did not have problems with colleagues from other centres (1,9 average in question 3.3), the support of the CEO was crucial to establish their research groups in many occasions (3,4 average,), and they think there is few contact with other R&D groups of their own centre (3,4 average), as it was observed in table 36 of Part 2 of this questionnaire.

Table 41. Current Main Priorities and Challenges of the R&D Area

3.4. PRIORITIES AND CHALLENGES	AVERAGE	STANDARD DEVIATIONS
3.4.1 To get higher long-term financing associated to projects	4,8	0,5
3.4.2 To get more basal funds not coming from national or international projects	4,0	1,0
3.4.3 To increase the number of international scientific publications	4,2	1,1
3.4.4 To attract good researchers	4,4	0,9
3.4.5 To improve the international collaborations	4,1	0,9
3.4.6 To develop a better scientific programme	4,1	1
3.4.7 To get more support from the CEO and TMT	3,4	1,3
3.4.8 To improve the scientific leadership of the R&D area	3,6	1,1
3.4.9 To achieve better support from the policy makers institutions	3,6	1,2
3.4.10 To improve the researchers employment opportunities	4,4	0,9
3.4.11 To increase collaborations with industry	3,7	1,0
3.4.12 To develop education & training programmes	3,3	1,1
3.4.13 To get practical and applicable results from the developed research projects	4,1	1,0
3.4.14 To get more support from other R&D areas	3,4	1,1
3.4.15 to improve the research culture of the area and the centre	3,3	1,1
3.4.16 To increase the support from other local or regional R&D areas	3,3	1,1
3.4.17 To face communication or collaboration internal problems	2,8	1,2

Likert scale 1 (not a priority) –5 (crucial priority)

Source: ***Own elaboration***

Dealing with internal problems of communication/collaboration Table 41 presents current priorities for the Heads of the R&D Areas or teams, being the least important challenges for them: To face internal communication problems (2,8 average); To develop training programmes (3,3 average); To improve the research culture of the area (3,3 value); And to increase the support they get from other R&D areas within their centre (3,3 average). On the contrary, to get funds from competitive projects in the long term is almost an absolute challenge for the directors of the R&D Areas (4,8 average).

Part 4. Incentives policy towards researchers to increase the application and acquisition of international funded projects

Table 42. Type of Incentives Provided by the Institution to Staff of the R&D Groups in the Last Year

4.1. INCENTIVES OFFERED		N	%
4.1.1 The Area researchers have a fixed annual budget, whether they succeed or not in competitive projects acquisition	Yes	21	21,9
	No	75	78,1
4.1.2 My centre assigns a higher budget to my Area depending on the international projects we gain (do not consider the funds coming from projects)	Yes	22	23,2
	No	73	76,8
4.1.3 My centre provides non-cash benefits to those areas and researchers who gain more international projects (travel to congresses, courses, short stays, workshops, etc. not paid by the project funds)	Yes	7	7,4
	No	88	92,6
4.1.4 My centre gives internal funding to contract research staff to those areas who get more international competitive projects (staff not paid directly by project funds)	Yes	16	16,8
	No	79	83,2

Source: ***Own elaboration***

Table 42 shows that centres give almost no incentives to researchers when applying and getting international projects. Indeed, all negative responses to the potential incentives, which could be offered by the institutions in relation to this issue, are higher than 75%.

Table 43. Incentives Given to Researchers in relation to International Competitive Fund Acquisition

4.2. TYPE OF INCENTIVES/EFFECTS	AVERAGE	STANDARD DEVIATIONS
4.2.1 It positively affects the salary of the researchers of the team who obtain the project	1,6	1,1
4.2.2 It increases the promotion opportunities for the R&D team staff who acquire the project	2,9	1,4
4.2.3 It allows the applicant R&D team to develop things that make them feel good with themselves	3,8	1,0
4.2.4 It provides the project application research group higher safety to keep their jobs	3,3	1,4
4.2.5 It offers the R&D team members good opportunities to develop their skills and abilities	4,0	0,9
4.2.6 It provides the members of the applicant team greater freedom, in terms of time flexibility, autonomy, less supervision, etc.	1,9	1,1
4.2.7 It enables the members of the project applicant team to achieve worthy objectives for them	3,9	0,9
4.2.8 It improves the appreciation and respect applicant team researchers receive from the rest of their colleagues	4	0,9
4.2.9 It improves the recognition R&D team members receive from their superiors	3,6	1,2
4.2.10 It improves friendship researchers maintain with people they work with (managers, other researchers, etc.)	2,6	1,2

Likert scale 1 (do not occur)–5 (always occurs)

Source: ***Own elaboration***

Part 4 of the questionnaire asked about potential incentives to researchers, intrinsic and extrinsic rewards, which may be applied by the institutions to promote international projects. Results of table 43 show that extrinsic reward corresponding to question 4.2.1, regarding increases of salary of the R&D team who gain international projects, with 1,6 average, practically does not exist in our sample. The intrinsic reward of achieving more freedom (like flexibility, autonomy and less supervision) on the job, included in item 4.2.6., obtained an average of 1,9. These results are similar to the ones obtained in the questionnaire addressed to the CEO and the one to the Heads of the R&D Areas and teams, regarding the incentives policies encouraged by their research organizations.

Part 5. Demographic characteristics of the Head of the R&D Area

Table 44. Socio-demographic Characteristics of the Head of the R&D Area

TENURE		N	%
5.1 Number of years as Head of Research Area	<5	29	30,2
	5 - 10	38	39,6
	>10	29	30,2
EXPERIENCE IN SIMILAR JOBS		**N**	**%**
5.2 Number of years in similar previous jobs	<5	46	48,4
	5 - 10	16	16,8
	>10	33	34,7
PARTICIPATION IN TMT		**N**	**%**
5.3 Participation in the scientific strategy of the centre?	Yes	72	74,2
	No	25	25,8
SEX		**N**	**%**
5.4 Sex of the Head of the Area	Male	69	75,8
	Female	22	24,2
BACKGROUND; EDUCATION		**N**	**%**
5.7 Education degree	No answer	7	7,2
	Bioinformatics	1	1,0
	Biology	31	32,0
	Pharmacy	12	12,4
	Mathematics	1	1,0
	Medicine	35	36,1
	Chemistry	10	10,3
5.5 AGE OF THE HEAD OF THE AREA (AVERAGE, SD)		52,8	7,0

D= Standard deviation

Source: ***Own elaboration***

Table 44 shows results about the tenure of the Heads of the R&D Areas in their current positions, and 39% of them have stayed in their jobs between 5 to 10 years. In addition, 48,4% of them were previously employed in similar jobs for less than 5 years. Almost 75% do participate in the scientific strategy of their centres, meaning they are part of the TMT of their institutions. In addition, table 44 also shows that 75,8% of the Heads of the R&D Areas are male, more than 90% of them have a Biomedicine and/or Health academic background (36,10% physicians), and their average age is 52 years old.

6.2. CORRELATION ANALYSIS

While the descriptive analysis takes a small step toward developing a global perspective of factors influencing effectiveness/productivity of R&D groups in terms of acquiring international competitive projects, it cannot identify the relative contribution of these factors to the variation in the effectiveness/productivity variable. For that, we turn to correlation analysis between the items of the questionnaires and the dependent variable effectiveness/productivity. We used the Pearson correlation coefficient and Spearman Rho coefficient (Aczel and Sounderpandian, 2006) when needed, using SPSS 20.0 statistical programme. Indeed, to better understand the proposed research model, the correlation analysis will be focused in the key actors who mainly influence the proactivity and efficacy of work teams within R&D centres, which have been considered in our research model: Research Management Offices and Heads of R&D Areas.

6.2.1. *Correlations of Efficacy and Items of Research Management Offices*

First part of the survey to the Head of the Project Management Office was based on the type of activities and tasks undertaken by the Research management staff in the last year (*Part 1. Activities developed by the Research Management Office*). Correlation analysis shows the positive association between efficacy of the centre and item 1.1.2 *Applied projects to international competitive programmes*. Following the descriptive results, where we saw that the highest amount of activities developed within the office are related to the application and management of international competitive funded projects, the Pearson correlation coefficient of ,420 confirms that the efficacy of the centre is positively related to the amount of applied projects to international competitive programmes.

First part of the questionnaire also included several sections regarding results in the application and acquisition of international competitive projects. Item 1.2 collected information about the amount of international projects applied by the centre (*1.2 International competitive projects applied by the centre in the last 5 years*). Correlation analysis showed that the amount of projects applied by R&D groups to the main international funding programmes during the last 5 years, are associated with the efficacy of the centre, with a Pearson correlation coefficient of,443. In addition, item 1.4. asked about the amount of international projects gained by the centre (*1.4. International projects gained by the centre in the last 5 years*). Correlation analysis for this item showed that the number of international projects got by the centre during the last 5 years is negatively associated with the efficacy of the centre. The negative Pearson correlation coefficients -,388 shows that the less amount of international projects gained by the centre and managed by the R&D management office, the less efficient is the institution. Section 1.8 of first part of the survey asked for the amount of international projects applied to different international agencies and different programmes in the last 5 years (*1.8. International projects applied in the last 5 years by main funding programmes*).

The second part of this questionnaire collected data about the actions implemented by the centres to boost the application and acquisition of international competitive projects (*Part 2. Policies oriented to increase the application and acquisition of international competitive funds*). Intrinsic and extrinsic incentives offered by the organization to research managers when acquiring competitive projects, where asked (*2.1 Incentives to research managers when R&D groups gain international competitive funded projects*). The correlation analysis showed that extrinsic rewards asked in items 2.1.3 *It provides the members of the Office higher safety to keep their jobs*, 2.1.4 *It increases the promotion opportunities for the members of the Research Management Office*, 2.1.6 *It improves the recognition the Office members receive from their superior* are positive associated with the efficacy of the centre. Besides, intrinsic rewards like item 2.1.7 *It provides the members of the Office greater freedom, in terms of time flexibility, autonomy, less supervision, etc.*, and item 2.1.8 *It enables the members of the Office to reach objectives which are worthy for them* are also positive associated with the efficacy of the centre. The Pearson correlation coefficients of these 5 items confirm that the efficacy of the centre is associated with the amount of incentives research managers may receive when international competitive projects are acquired.

Table 45 gather the correlation analysis results between the items included in the research management offices questionnaire and the efficacy of the centres by competitive projects acquisition and international funds obtained.

Table 45. Correlations of Items of Research Management Offices Questionnaire

ITEMS	CORRELATION INSTRUMENTS	PROJECTS RATIO	FUNDING RATIO
Projects ratio	Pearson correlation	1	,510(**)
	Sig. (bilateral)		0,007
	N	27	27
Funding ratio	Pearson correlation	,510(**)	1
	Sig. (bilateral)	0,007	
	N	27	27
1.1.2 Applied projects to international competitive programmes	Pearson correlation	,420(*)	0,07
	Sig. (bilateral)	0,041	0,745
	N	24	24
1.2. International projects applied by the centre in the last 5 years	Pearson correlation	,443(*)	-0,121
	Sig. (bilateral)	0,021	0,547
	N	27	27
1.4. International projects gained by the centre in the last 5 years	Pearson correlation	-0,096	-,388(*)
	Sig. (bilateral)	0,632	0,046
	N	27	27
2.1.3. It provides the members of the Office higher safety to keep their jobs	Pearson correlation	,597(**)	0,311
	Sig. (bilateral)	0,001	0,115
	N	27	27
2.1.4. It increases the promotion opportunities for the members of the Research Management Office	Pearson correlation	0,266	,449(*)
	Sig. (bilateral)	0,181	0,019
	N	27	27

Table 45. Correlations of Items of Research Management Offices Questionnaire (cont.)

ITEMS	CORRELATION INSTRUMENTS	PROJECTS RATIO	FUNDING RATIO
2.1.6. It improves the recognition the Office members receive from their superior	Pearson correlation	,392(*)	0,253
	Sig. (bilateral)	0,043	0,203
	N	27	27
2.1.7. It provides the members of the Office greater freedom, in terms of time flexibility, autonomy, less supervision, etc.	Pearson correlation	0,301	,404(*)
	Sig. (bilateral)	0,127	0,037
	N	27	27
2.1.8. It enables the members of the Office to reach objectives which are worthy for them	Pearson correlation	,384(*)	0,199
	Sig. (bilateral)	0,048	0,32
	N	27	27

**The correlation is significant at 0,01 level (bilateral)*
** The correlation is significant at 0,05 level (bilateral)*

Source: ***Own elaboration***

i. Correlations of the variable "Workload" at the Research Management Offices

First part of the questionnaire addressed to the Head of the Project Management Offices was based on the type of activities usually developed by the research management staff, as part of their habitual professional tasks (*Part 1. Activities developed by the Research Management Office*). Information about the different services provided by the management office staff to R&D groups when researchers apply for international competitive projects was collected (*1.1 Type of activities managed by the office in the last year*). Besides, part 3 of the questionnaire inquired about the composition of the research management office (*Part 3. Research Management Office composition and the demographic characteristics of its staff members*). In particular, we focused in the amount of people pertaining to the office (*3.1.1Total number of members of the Research Management Office*). This information allowed us to calculate the variable "workload", in order to measure the amount of works research managers hold at each centre of the ample. As mentioned in the descriptive analysis, the services provided to the R&D teams are part of the tasks and duties of these offices, but they may be more or less specialised and personalised to the specific needs of the R&D groups' demands. In addition, the amount of work will depend on the number of persons at the office who implement research management activities, ergo the size of the office. Thus, we obtained the new variable values dividing the amount of R&D management activities developed by the office between the number of persons work at them. For the analysis of the correlation between the Workload and the efficacy of the centre, we used the Rho of Spearman coefficient and Tau of Kendal values (Aczel and Sounderpandian, 2006). We got negative but significant relations between the workload and the efficacy of the centre in terms of funding ratio by competitive projects. This indicates that the workload of the office will influence the efficacy of the centre, meaning the less activity undertaken by research managers at the projects offices, the less efficient will be their institutions. Table 46 shows the results obtained for the associations of this variable items and the efficacy of the centres.

Table 46. Correlations of the Variable "Workload"

	ITEMS		PROJECTS RATIO	FUNDING RATIO	WORKLOAD
Tau_b of Kendall	Projects ratio	Correlation coefficient	1	,429(**)	-0,038
		Sig. (bilateral)	.	0,002	0,786
		N	27	27	27
	Funding ratio	Correlation coefficient	,429(**)	1	-,315(*)
		Sig. (bilateral)	0,002	.	0,024
		N	27	27	27
	Workload	Correlation coefficient	-0,038	-,315(*)	1
		Sig. (bilateral)	0,786	0,024	.
		N	27	27	27
Rho of Spearman	Projects ratio	Correlation coefficient	1	,567(**)	-0,042

Table 46. Correlations of the Variable "Workload" (cont.)

	ITEMS		PROJECTS RATIO	FUNDING RATIO	WORKLOAD
		Sig. (bilateral)	.	0,002	0,837
		N	27	27	27
	Funding ratio	Correlation coefficient	,567(**)	1	-,453(*)
		Sig. (bilateral)	0,002	.	0,018
		N	27	27	27
	Workload	Correlation coefficient	-0,042	-,453(*)	1
		Sig. (bilateral)	0,837	0,018	.
		N	27	27	27

*** The correlation is significant at 0,01 level (bilateral)*
** The correlation is significant at 0,05 level (bilateral)*

Source: ***Own elaboration***

6.2.2. Correlations of Efficacy and Items of Heads of R&D Areas Questionnaire

The Research Area Director Questionnaire first section inquired about the type of activities performed within the R&D Area, in relation to the acquisition of competitive funds (*Part 1. Type of activities performed within the Research Area, in relation to the acquisition of competitive financing)*. In section 1.6 we collected information about the different actions developed by the R&D groups when looking for partners to build international consortiums (1.6 *Actions for partner search and networking developed by the R&D groups when applying for competitive projects*). In particular, correlation analysis results showed that item 1.6.2 *Contact with known national R&D groups* have a positive relation with the efficacy of the centre. The positive Pearson correlation coefficient of ,225 matches with the previous descriptive analysis, since among the different actions done by the groups when looking for partners to build international consortiums, R&D teams use to contact other R&D known teams, more often than using Web sites for partner search or establish contact with the private companies.

Part three of the survey collected data relative to the relationships between the R&D group and their managerial structures (*Part 3. Relationships between the R&D group and the CEO or TMT*) and the support R&D area receive concerning their priorities, difficulties encountered, needs and challenges, etc. Part 3.4 inquired about the main priorities and challenges of the R&D Areas (3.4 *Current main priorities and challenges of the R&D Area*). Item 3.4.6 *To develop a better scientific programme*, showed a positive correlation with the efficacy of the centres in terms of competitive projects acquisition. The Pearson correlation coefficient of ,231 indicates that the most efficient centres of our sample are those focused in implementing good science and high scientific annual programmes, although in the descriptive analysis, to get funds from competitive projects in the long term was a complete challenge for the responsible of the R&D Areas.

In part fourth of this questionnaire we inquired about current and potential incentives offered by the institutions to their researchers, in order to increase competitive fund acquisition, both intrinsic and extrinsic rewards (*Part 4 Incentives Policy towards researchers to increase the application and acquisition of international funded projects)*. Section 4.2 collected information about the type of effects or incentives (4.2 *Incentives given to researchers in relation to international competitive fund acquisition*). Correlation analysis shows that some of the possible incentives given to researchers in relation to international competitive fund acquisition had a significant but negative correlation with the efficacy variable. Specifically, item 4.2.2 *It increases the promotion opportunities for the R&D team staff who acquire the project*, item 4.2.4. *It provides the project application research group higher safety to keep their jobs*, and item 4.2.9 *It improves the recognition R&D team members receive from their superiors*. Pearson correlation coefficients were -,202, -,293 and -,235 respectively. This indicates that promotion opportunities, job security and praise by supervisors to researchers, when the R&D groups gain international competitive funds are not implemented by the centres. There is not an incentives policy encouraged by the research organizations, but the application of them would influence the efficacy of the centre, achieving better results and competitiveness.

Table 47 shows the correlation analysis results between the items included in the Head of the R&D Areas survey and the efficacy of the centres, in terms of international projects and funding acquisition by the R&D groups.

Table 47. Correlations of Items of R&D Areas Questionnaire

ITEMS	CORRELATION INSTRUMENTS	PROJECTS RATIO	FUNDING RATIO
Projects ratio	Pearson correlation	1	,606(**)
	Sig. (bilateral)	0	0
	N	97	97
Funding ratio	Pearson correlation	,606(**)	1
	Sig. (bilateral)	0	0
	N	97	97
4.2.2. Promotion opportunities	Pearson correlation	-,202(*)	-0,143
	Sig. (bilateral)	0,048	0,162
	N	97	97
4.2.4. Job security	Pearson correlation	-,293(**)	-0,179
	Sig. (bilateral)	0,004	0,079
	N	97	97
4.2.9. Prise by supervisors	Pearson correlation	-,235(*)	-0,057
	Sig. (bilateral)	0,021	0,578
	N	97	97
1.6.2. Contact with known R&D national groups	Pearson correlation	-0,055	,225(*)
	Sig. (bilateral)	0,595	0,028
	N	96	96
3.4.6. Develop a better scientific programme	Pearson correlation	,231(*)	-0,085
	Sig. (bilateral)	0,023	0,409
	N	97	97

***The correlation is significant at 0,01 level (bilateral)*
** The correlation is significant at 0,05 level (bilateral)*

Source: ***Own elaboration***

Table 48 summarizes all correlation analysis between efficacy of the centres and the key actors of our survey: CEO, Heads of Research Management Offices and Heads of R&D Areas, in terms of international projects and funding acquisition.

Table 48. Correlation of Efficacy and Items of Key Actors Questionnaires

KEY ACTORS	ITEMS	EFFICACY
RESEARCH MANAGEMENT OFFICES		Pearson Correlation
1.1. Part 1. Type of activities developed by the Research Management Office		
	1.1.2. Applied projects to international competitive programmes	0,420 (*)
1.2. International projects applied by the centre in the last 5 years		0,443(*)
1.4. International projects gained by the centre in the last 5 years		-,388(*)
2.1. Incentives to research managers when R&D groups gain international competitive funded projects		
	2.1.3. It provides the members of the Office higher safety to keep their jobs	,597(**)
	2.1.4. It increases the promotion opportunities for the members of the Research Management Office	,449(*)
	2.1.6. It improves the recognition the Office members receive from their superior	,392(*)
	2.1.7 It provides the members of the Office greater freedom, in terms of time flexibility, autonomy, less supervision, etc.	,404(*)
	2.1.8. It enables the members of the Office to reach objectives which are worthy for them	,384(*)

Table 48. Correlation of Efficacy and Items of Key Actors Questionnaires (cont.)

KEY ACTORS	ITEMS	EFFICACY
RESEARCH MANAGEMENT OFFICES		Pearson Correlation
1.6. Partner search and networking activities developed by R&D groups when applying for international competitive projects		
	1.6.2. Contact with known R&D national groups	,225(*)
3.4. Current main priorities and challenges for the R&D Area		
	3.4.6. Develop a better scientific programme	,231(*)
4.2. Incentives given to researchers in relation to international competitive fund acquisition		
	4.2.2. Promotion opportunities for the R&D group	-,202(*)
	4.2.4. Job security	-,293(**)
	4.2.9. Praise by supervisors	-,235(*)

***The correlation is significant at 0,01 level*

** The correlation is significant at 0,05 level*

Source: ***Own elaboration***

6.3. ANALYSIS OF MEASUREMENT INSTRUMENTS AND RESEARCH MODEL TEST

To test the research model, we used the partial least square (PLS) technique, a variance-based Structural Equation Modelling (SEM) method. As already mentioned, we selected PLS to examine the proposed model because this technique is suitable for assessing theories in the early stages of development (Chin, Marcolin and Newsted, 2003), as in the case of this study. In addition, compared to other SEM techniques, PLS requires minimal demands on sample size in order to validate a model (Chin et al. 2003). Therefore, PLS is an appropriate analysis tool for testing the proposed model for this study.

We used the SmartPLS software (Ringle et al. 2005) simultaneously for the measurement model and the structural model analysis. According to Barclay, Higgins and Thompson (1995), we first need to validate the measuring instrument and secondly to proceed to estimate the structural model.

6.3.1. Measurement Instruments

For the assessment of the validity and reliability of the measurement model, we have analysed whether the theoretical concepts are properly measured by the observed variables. This analysis consists in verifying the validity characteristics (if it really measures what we want to measure) and reliability (if it has been done in a stable and consistent way). But in the assessment of the structural model, we will have to assess the weight and magnitude of the relationships between the variables.

The evaluation of the measurement model involved the analysis of the individual items reliability, the internal consistency or scale reliability, the convergent validity and the discriminant validity (Barclay et al. 1995; Cepeda and Roldan, 2005). For the reliability of the individual items, we obtained a factorial structure of six dimensions or factors in which each item loaded higher in their factor (with loads higher than 0,7) and lower in the rest, except for *PRIOR items* (Heads of R&D Areas: *Current main priorities and challenges of the R&D Area*) (*3.4.9 To achieve better support from the policy makers institutions*, and *3.4.17 To face communication or collaboration internal problems*); the *INCRMO items* (Heads of the Research Management Offices: *Type of Incentives to research managers when gaining international competitive projects*) (*2.1.1 It positively affects the salary of the members of the Research Management Office; 2.1.2 It positively affects the salary of ALL researchers of the centre*, even though not pertaining to the group who get the international project; *2.1.6 It improves the recognition the Office members receive from their superior; 2.1.7 It provides the members of the Office greater freedom, in terms of time flexibility, autonomy*, less supervision, etc. and 2.1.11 *It offers the Office members good opportunities to develop their skills and abilities*); the *PROACT items* (Heads of the Research Management Offices: *International projects applied in the last 5 years by main funding programme*) (*1.8.2 7th FP-Cooperation-BIO*; *1.8.3 7th FP-Cooperation-TIC*; *1.8.4 7th FP-*

Cooperation-Environment; *1.8.5 7th FP-Cooperation-NANO*; *1.8.8. 7th FP-Infrastructures*; *1.8.9 7th FP- Large Initiatives*; *1.8.10 DG ENVIRONMENT-LIFE+ Programme*; *1.8.12 DG JUSTICE-DAPHNE Programme*; *1.8.13 European Social & Cohesion Programme–FEDER Funds* and *1.8.14 7th FP-CIP*) items, whose loads with corresponding dimensions were lower than 0,7. We proceeded to remove these items from their corresponding factors, obtaining favourable results for the rest of the items.

Regarding the *INCRMO items 2.1.8 It enables the members of the Office to reach objectives which are worthy for them* and *2.1.10 It allows the Office members to develop things that make them feel good with themselves*, they showed multicollineality problems in relation to the multicollinearity diagnosis made and the statistical collinearity FIV (inflation factor variance) and T (tolerance) revision. For the analysis of multicollinearity we used SPSS version 18.0.0 programme. We proceed to remove the two mentioned items, thus multicollinearity problems disappeared showing each pair of items tolerance ratios >0,2 and FIV <5, with favourable assessment according to Kleinbaum, Kupper and Muller(1998).

Reliability of the constructs was calculated based on the Cronbach α and the Composite Reliability Index (CRI) criteria, giving values higher than 0,7 in all cases, which is the recommended rate (Churchill, 1979). To analyse the convergent validity we used the Average Variance Extracted (IVE), which is an indicator of the captured variance by a factor in regard to the variance due to measurement error (Fornell and Larcker, 1981). The IVE values were higher than 0,5 in all cases, meaning that more than 50% of the variance of each construct is due to their indicators (Cepeda and Roldan, 2005). The results of the analysis of the measuring scale are shown in Table 49.

Table 49. Reliability and Convergent Validity

Factor	Item		Loading	Cronbach´s α	CRI	AVE
F1. Priorities Heads of R&D Areas (PRIOR)	PRIOR341	To get higher long-term financing associated to projects	0,9804*	0,9833	0,985	0,818
	PRIOR3410	To improve the researchers employment opportunities	0,9804*			
	PRIOR3411	To increase collaborations with industry	0,9778*			
	PRIOR3412	To develop education & training programmes	0,8031*			
	PRIOR3413	To get practical and applicable results from the developed research projects	0,8029*			
	PRIOR3414	To get more support from other R&D areas	0,8029*			
	PRIOR3415	To improve the research culture of the area and the center	0,8029*			
	PRIOR3416	To increase the support from other local or regional R&D areas	0,7172*			
	PRIOR342	To get more basal funds not coming from national or international projects	0,9807*			
	PRIOR343	To increase the number of international scientific publications	0,9758*			
	PRIOR344	To attract good researchers	0,7445*			
	PRIOR345	To improve the international collaborations	0,9782*			
	PRIOR346	To develop a better scientific programme	0,9774*			
	PRIOR347	To get more support from the CEO and TMT	0,9799*			
	PRIOR348	To improve the scientific leadership of the R&D area	0,9806*			
F2. Incentives to Research Management Offices (INCRMO)	INCRMO213	It provides the members of the Office higher safety to keep their jobs	0,8708*	0,8833	0,918	0,738
	INCRMO214	It increases the promotion opportunities for the members of the Research Management Office	0,8277*			
	INCRMO215	It improves the appreciation and respect members of the Office receive from the rest of the staff	0,9033*			
	INCRMO219	It offers opportunities for the Office members to learn new things	0,8325*			
F3. Workload of Research Management Offices (WORKRMO)	WORKRMO	Amount of activities undertaken by the research management office in the last year, in relation to the staff members of the office	1*	1	1	1
F4. Number of researches in the centres (NRESEAR)	NRESERAR	Number of research staff in the centres	1*	1	1	1
F5. Proactivity of the Centre: International projects applied by main Funding Programmes (PROACT)	PROACT181	7th FP - Cooperation– Health	0,8100*	0,8924	0,925	0,756
	PROACT1815	7th FP - Cooperation-NANO	0,8783*			
	PROACT186	7th FP - IDEAS (ERC)	0,9160*			
	PROACT187	7th FP - PEOPLE (Marie Curie Actions)	0,8708*			
F6. Efficacy of the Centre: International projects gained by the centre (EFFIC)	EFFIC	Amount of international competitive projects acquired by the centre in the last five years	1*	1	1	1

*All loadings are significant (p<0,001)

Items PRIOR (349 y 3417); Items INCRMO (211, 212, 216, 217 y 2111); Items PROACT (182, 183, 184, 185, 188, 189, 1810, 1812, 1813 and 1814) were eliminated (the values of their loads were below 0,7)

Source: ***Own elaboration***

The discriminant validity was calculated comparing the square root of the average variance extracted (AVE) with the correlations between factors. We intended to show that the correlations between constructs were lower than the square root of the AVE. It was found that these correlations were lower than all the square roots of the AVE, proving the discriminant validity. In Table 50 results of these analyses are shown.

Table 50. Discriminant Validity Coefficients

	Incentives to Research Management Offices (INCRMO)	Number of researches in the centre (NRESEAR)	Priorities Heads of R&D Areas (PRIOR)	Proactivity of the Centre: International projects applied by main Funding Programmes (PROACT)	Efficacy of the Centre: International projects gained by the centre (EFFIC)	Workload of Research Management Offices (WORKMRO)
INCRMO	0,859	0	0	0	0	0
NRESEAR	0,4271	1	0	0	0	0
PRIOR	-0,0579	-0,0778	0,904	0	0	0
PROACT	0,3507	0,4685	-0,0953	0,869	0	0
EFFIC	0,3445	0,516	-0,1126	0,796	1	0
WORKMRO	0,3037	0,6291	0,0553	0,5447	0,6303	1

Values of the diagonal in bold: Square root of extracted variance
Values below the diagonal: Estimated correlation between factors

Source: ***Own elaboration***

6.3.2. *Structural Model Estimation*

After evaluating the psychometric properties of the measurement instruments, we analysed the structural model using PLS. To assess the structural model's predictive capacity, bootstrapping yielded R^2 values, which reflect the amount of the variance of the construct explained by the model. We followed the criteria of Falk and Miller (1992), for whom each of the dependent constructs R^2 must be above 0,1 and lower values, although significant, would not be acceptable. Table 52 shows that the R^2 of all dependent factors were higher than 0,1 (the critical mentioned level).

We continued analysing the model predictability by performing the test Stone-Geisser (Q^2) for each dependent construct, using the blindfolding method. It revealed that the model had an acceptable predictive ability, with values above 0 in all cases (R^2 values >0; see Table 52).

Table 51. Hypotheses Testing

RELATIONSHIP	HYPOTHESES	Standarized β	t-Value bootstrap
H1: PROACTIVITY of the centre → EFFICACY (International projects gained by the centre)	Accepted	0,617 ***	7,86
H2a: PRIORITIES Heads of R&D Areas →PROACTIVITY of the centre	Accepted	-0,099**	1,821
H2b: PRIORITIES Heads of R&D Areas →EFFICACY (International projects gained by the centre)	Accepted	-0,163*	1,523
H3a:INCENTIVES to Research Management Office →PROACTIVITY of the Centre	Accepted	0,163**	2,08
H3b: INCENTIVES to Research Management Office →EFFICACY (International projects gained by the centre)	Rejected	0,025 n.s	0,719
H4a: WORKLOAD of Research Management Office →PROACTIVITY of the Centre	Accepted	0,428 ***	3,002
H4b:WORKLOAD of Research Management Offices →EFFICACY (International projects gained by the centre)	Accepted	0,260 ***	2,924
No of researches in the centre → Proactivity of the Centre	Rejected	0,126 n.s	1,248
No of researches in the centre →Efficacy (International projects gained by the centre)	Rejected	0,048 n.s	0,85
No of researches in the centre → Workload of Research Management Offices	Accepted	0,629 ***	7,459

*p< 0,1; **p< 0,05; ***p< 0,01
R^2 (workload of Research Management Offices)= 0,396 ; R^2 (proactivity of the centre)= 0,355; R^2 (efficacy or international projects gained by the centre)= 0,696
Q^2 (workload of Research Management Offices)= 0,395 ; Q^2 (proactivity of the centre)= 0,240; Q^2 (efficacy or international projects gained by the centre)= 0,264

Source: ***Own elaboration***

Results in table 51 confirm the importance of the relations between the independent variables –priorities Heads of R&D Areas, incentives to Research Management Offices– and proactivity of the Centre, as well as the relationship between the independent variables –priorities Heads of R&D Areas, workload of Research Management Offices, proactivity of the centre– and international projects gained by the centre. These results show that the priorities of Heads of R&D Areas (H2a: β= -0,099; p <0,05) negatively and directly influence in the proactivity of the centre. While incentives to Research Management Offices (H3a: β = 0,163 p <0,05) and workload of Research Management Offices (H4a: β = 0,421; p <0,01) positively and directly influence in the proactivity of the centre. The most intense relationship is the one established between the workload of Research Management Offices and the proactivity of the centre (H4a), and the least intense relationship was established between the priorities of Heads of R&D Areas and the proactivity of the centre (H2a).

Among the previous independent variables, the workload of Research Management Offices has the highest percentage of explained variance of the proactivity of the centre variable (22,93%), followed by the number of researchers in the centre variable (5,90%), incentives to Research Management Offices (5,71%) and priorities of Heads of R&D Areas (0,94%).

Results also show that the priorities of Heads of R&D Areas (H2b: β = -0,064; p <0,1) have a direct and negative impact on international projects gained by the centre variable, and the workload of Research Management Offices (H4b: β = 0,260; p <0,01) positively and directly influences the international projects gained by the centre. The most intense relationship is established between the workload of Research Management Offices and the international projects gained by the centre (H4b), and the least intense relationship was established between the priorities of Heads of R&D Areas and international projects gained by the centre (H2b).

Furthermore, results show that the number of researchers in the centres has a direct and positive impact on the workload of the Research Management Offices (β = 0,090; p <0,05),but has not influence in the proactivity of the centre and the international projects gained by the centre.

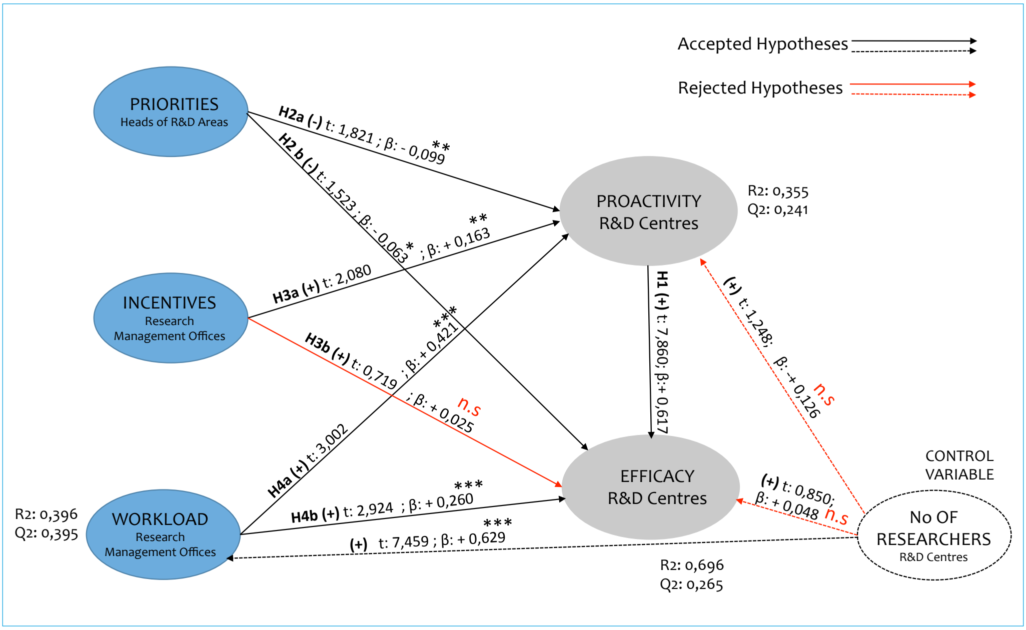
Likewise, results also show the direct and positive relationship between the proactivity of the centre (International projects applied) and the international projects gained by the centre.

The international projects gained by the centre are explained by the proactivity of the centre in a 49,11%, followed by the workload of the Research Management Offices (16,39%), the number of researchers in the centre (2,48%), the incentives to Research Management Offices (0,86%) and the priorities of the Heads of R&D Areas (0,72%).

The number of researchers in the centre is <u>a control variable</u> that positively and directly influences the workload of the Research Management Offices (β = 0,629; p <0,001). In fact, this variable explains 39,60% of the variance of the workload of the Research Management Offices.

The final structural model is shown in Figure 9, with the corresponding accepted and rejected hypothesis after the validation process.

Figure 9. Structural Model with control Variables



6.4. ADDITIONAL RESULTS FROM OTHER EUROPEAN R&D CENTRES

The target population of the study have been Spanish R&D public centres which conduct their activities in the Life Sciences research field, in particular within the areas of Biomedicine and Health. In regards to the sample of the study, 47 Spanish R&D public centres were contacted. This type of centres have around 6 to 10 R&D main departments or key research areas, and most of them had probed experience in international competitive funds acquisition by sponsored projects, according to the information obtained from personal interviews and the secondary data collection. Nevertheless, to achieve an improved overview of the situation of Spanish R&D institutions in comparison with other countries, we established contact with 2 European R&D public entities sited in Belgium, with expertise in competitive awarded projects.

Although conclusions achieved for these particular centres may not be determinant for our study, to contact these European centres has allowed us to make a first approach to other institutions outside Spain with similar characteristics, and to compare the national structures with analogous organizations in the European scope. For collecting information though the new surveys, we adapted the questionnaires we had addressed to the CEOs, the Heads of the R&D Areas and the Head of the Research Management Offices of the centres of our sample, in order to shorter, integrated all of them in a unique questionnaire adapted to a personal interview, thus fitting them to the new European ambit.

We obtained the contact details of the centres though the Foundation of the Valencia Region European Office in Brussels, who recommended us to get in touch with a public research foundation of a hospital, analogous to the Spanish ones. We completed the search checking at CORDIS website for the most successful R&D organizations in the 7th Framework Programme and the H2020 Programme for Health & Biomedicine thematic areas in Belgium. We arranged several personal interviews with the responsible persons of management and the scientific policy in both centres. One of the entities visited was a Research Foundation of a very large public Hospital in Brussels, and the other was a top public research centre of Biotechnology in Flanders.

The main objective of the Belgium Hospital Foundation is to promote research and mainly promotes training activities for its physicians, like stays outside and within the hospital itself, to do PhD studies, etc. They organize enough scientific events to transmit their activities, to raise money and to get awareness about research, while attracting new donations. The Medical Director of the hospital is the CEO or supervisor. This makes a clear link between the objectives of the hospital and the activities of the foundation. In addition to an external Scientific Committee, there is a Steering Committee (TMT) of which this person forms part, with the possibility of taking decisions and influencing the ones that are approved, including the decision of which calls to submit projects. Thus, the responsible person of the Research Management Office advises the Medical Director if a call is appropriate for the profile of the research group or for the department that wants to apply.

There are 20 departments in this hospital. As for recruitment policies, researchers are hired by the hospital or university, never by the foundation. And among the activities carried out to encourage the application of international projects, the preparation of a regular bulletin of competitive calls, both internal and external is done. If a researcher shows interest, they give personalized treatment in the follow-up of the call. However, they complained that sometimes the office hardly receives feedback from the researchers, and there is lack of communication both between the Office and the Medical Director and research groups. Here, they recognised there are many points of improvement for internal collaboration.

In terms of the profile or demographic characteristics of the Head of the Management Office, this was a multidisciplinary one. The person did not have a degree in Medicine or background in Health Sciences and had no medical training, but previously had worked for several NGOs, also writing project proposals and looked for funds for the projects they wanted to develop. This director expressed that sometimes research doctors are difficult to treat and the role of the office is similar to a National Contact Point but for the hospital: Information about competitive calls, finding partners, preparing applications, etc. but with low implications from research staff in the pre-award process.

As for the search for potential collaborators, they prefer to contact acquaintances of other projects with which they have previously worked, before launching themselves to seek partners from other entities with who to build a consortium and submit a project with people they are not sure about the respond to their expectations. This way of acting has some similarity to the behaviour showed by the Spanish centres, and described in the statistics analysis of chapter 6, in relation to the different actions developed by the R&D groups when looking for partners with the purpose of building international consortiums. Correlation analysis showed that research staff contact with known national R&D groups to build their partnership, and this has a positive relation with the efficacy of the centre. This findings also matched with previous descriptive analysis, where R&D work groups tend to contact with known R&D teams, among the different possible actions they could do when looking for partners to prepare international project proposals. To first contact and cooperate with national known groups is then the favourite method by researchers to look for partners, instead of using Web sites for partner search, establish contact with private companies, etc. Further, primary data collected from some Spanish centres also confirmed the difficulty sometimes senior R&D groups face trying to cooperate with other groups from abroad, with different interest, ways of work, different goals, etc.

In regards to the other contacted centre, it is a basic research, public, non-profit institute. Very powerful, it has a budget of 100 M€ per year, of which 54.3% is government subsidy and the rest comes half of projects and the other half of agreements with industry and technology transfer. It was created in 1996 with 622 scientists, and nowadays they had grown to 1.460 scientists in 2014.

Scientific excellence is the engine of this institute, aspiring to be the best in the world. For this purpose, they only hire super excellent researchers, who are the best in their field with their equipment. That is, they first sign contract with the people they want and then decide the research topic they will be dedicated within the centre. The excellence of the researchers is measured with bibliometric indicators (number of publications in JCR, ranking of the same), competitive and non-competitive results, etc. Researchers are guided in their research career and in European scholarships they are only focused on the pillar of Excellent Science of H2020 (ERC and Marie Curie Actions). In order to prepare winning proposals, they hire consultants in the proposal preparation phase. These external consultants are specialized in this type of aid to ensure success regardless of the high cost of preparation. And there is also an internal work of preparation of proposals, as they undergo rigorous internal reviews. H2020 Programme collaborative projects are not their priority, and if they participate they do so as partners, not as coordinators, as it means less effort for the money they give. They do not lobby the EC because they do not believe that the allocation system of the EC's competitive projects to be transparent. It seems that this model of focusing on excellent science is doing well, since among other grants they have 26 ERC scholarships. In fact, they use ERCs to import and export talent. Of the overheads of the project achieved, the institute only keeps 10%, and the rest is returned to the R&D group.

They have and annual Advisory Boards and every 5 years the institute is evaluated by the government, with international committees of external experts. Prior to that evaluation, they make an internal assessment of all their scientists, which leads them to select the best, the most excellent. Those who have not achieved the goals are invited to leave the institution after 5 years. They are replaced in other centres and they are supported for 2 years, neither do they want bad publicity or that they could be seen as they dismiss personnel. Regarding research management services, they have 9 management departments and 2 directors, one for the scientific part and another for the transfer of technology activities. There are 60 people in these departments supporting the scientific activity made by researchers. In fact, the management staff leaves the research groups themselves, so they have the same training as scientists and work in close connection with them. In fact, PI is the one that proposes the contracts with the companies, but the agreements are made in the central departments of the institute. Its strategy of business approach is always 2 or 3 years seen, wondering where they want to be in the next 3 years. And being on the market is one of its main objectives, becoming an international reference centre.

Chapter 7

Discussion and conclusions

7.1. MAIN CONTRIBUTIONS AND IMPLICATIONS

This study is an attempt to explain how and why certain factors reported to have a major influence on the efficacy of work groups (Choi et al. 2003; Lin et al. 2005) have an effect on the successful acquisition of competitive funding by R&D groups within public non-profit-making research institutions. We have developed some propositions based on the existing literature concerning international competitive funding programmes (Gabriele, 1998; Galsworthy and McKee, 2013; Grimpe, 2012; Kirby, 1992; Laudel, 2005, 2006), of work groups' efficacy in R&D public organizations (Choi, Price and Vinokur, 2003; Lin, Yang, Arya, Huang and Li, 2005), and managerial structures that support R&D work teams (Connell, 2004; Kennedy et al. 2009; Kirkland, 2005; McCallister and Miller, 1993).

We contribute to the literature on work group efficacy by proposing a novel approach connecting three widely accepted key theories the Attention-Based View of the firm (ABV) (Ocasio, 1997, 2011), the Self-Determination Theory (SDT) (Deci and Ryan, 1985a), and the Contingency Approach (Laurence and Lorsch, 1967; Thompson, 1967) with the aim of understanding better what determines researchers' proactivity and efficacy in acquiring international competitive funds and the influence Research Management Offices have in this process within Spanish R&D centres.

The proactivity of R&D teams has been assessed according to the number of international projects applied for by researchers, considering both the number of competitive projects and the economic quantity of projects requested to the main international funding programmes. In contrast, the efficiency of the centres has been measured by the number of international projects acquired by these institutions, both the number of competitive projects and the total economic sum of funds achieved by each centre. The study provides evidence that the proactivity of R&D groups –application for international competitive funded projects– is directly related to the efficacy of the centre, with the capacity for obtaining competitive external resources being positively associated with the number of project applications to the main European funding agencies. This is not solely because R&D teams have more possibilities of obtaining funds if they apply for projects, but it is to be expected that research staff who apply for projects will be more effective than those who never apply for this kind of funding.

International project applications are a long and complex process, and researchers tend to encounter considerable difficulties in following the international norms and bureaucratic requirements set out in the calls. Moreover, finding the appropriate network of international partners required for most of these calls can be a problem for the principal investigators, if they are not used to cooperating in the international arena and have not established previous contacts with external groups in their field of activities. In addition, the success of a project proposal depends on the annual programme funds, the type of funding actions, and the budget provided for each topic (number of projects to be granted for each topic), among other parameters. According to the latest statistics offered by the H2020 programme for 2017, the current overall success rate of eligible proposals is around 14% compared with around

20% for the whole of 7th FP, since most eligible projects cannot be funded due to the significant quantity of project proposals in comparison to the available programme budget, and restrictions in the number of projects initially planned to be awarded. Despite this, researchers who have applied for international projects without success and who keep trying following several rejections can improve the standard of their proposals by incorporating the valuable feedback provided by reviewers and policy officers', taking advantage of their better knowledge of the programme's rules, writing better quality project memos, and thus increasing their chances of being awarded funding in future calls. They will also improve their knowledge of the overall funding processes, increasing their chances of calls success. In this way, we have confirmed that proactive researchers will be more effective or successful than less proactive R&D team members. Nevertheless, although proactivity is a variable associated with the efficacy of centres, less productive researchers may become less proactive over time. This important effect should be taken into account and analysed when addressing efficacy in acquiring competitive projects, although, for our study, we have assumed that the most proactive centres are the most effective ones. The most successful R&D institutions will be those with the highest participation in R&D competitive calls, meaning those with the largest number of project applications submitted to current international funding programmes.

We have used the Attention-Based View of the firm (ABV) theory (Ocasio, 1997, 2011) to integrate a tentative explanatory framework, since the **prioritisation of R&D activities by Heads of the Research Areas** has been confirmed to influence the proactivity of their work groups and the overall efficacy of their centres, hypothesised in research questions 2a and 2b of our model. The ABV theory has highlighted the role of managerial capacity to develop certain type of activities regarding international competitive projects, and we have extended this theory, since we demonstrate that the priorities of R&D Areas in regard to their promotion of international project applications are crucial to understand how centres perform and in which aspects certain organizations differ from others.

The Heads of R&D Areas of the centres assessed in our study –coordinators of the different research lines and groups– are the persons who establish the range of activities to be developed by their research teams and group priorities in the short-medium term. They also make decisions about which activities should come before others, and on which tasks work teams should focus their attention and employ resources. In the framework of our study, the application for and acquisition of competitive funds is one of the activities R&D groups can develop. The proactivity and efficacy of research teams should be a priority depending on the importance and support given by the Head of Area in comparison with other activities, all of which are undertaken by the work teams to fulfil the Area objectives and meet annual outcomes, presumably aligned with the action plans and general R&D policy of the centre. Data of the main priorities established by the Heads of R&D Areas provided us with vital information about the attention research staff pay to this objective, and the influence of this prioritisation on the proactivity and overall efficacy of their institutions.

We have noted that the public system in Spain is highly restrictive and constrained, and that most of the institutions in our sample displayed similar patterns with respect to their incentives policy and research staff recruitment. This restrictive system is embodied by inflexible structures that allow little flexibility in the contracting of personnel or in motivating staff. Indeed, during the primary data collection process, they all complained about the limited freedom of movement to decide and hire research personnel. When the budget allows the contracting of new research staff, some public centres can only contract personnel –mainly civil servants– from their own network of centres, as they belong to the General Administration of the State. Thus, even when funds are not a problem, vacancies must be made available through public offers of employment, with little agility permitted by procedures and requirements laid down by the State. In this context, research centres have little limited freedom of action or decision-making power over whom to employ. Researcher posts (even when funding is provided by projects, cooperation agreements, etc.) have to pass several approval processes. Public procedures tend to be time-consuming and clash with the tight deadlines of competitive projects, with PIs being unable to contract research staff on time and sacrificing opportunities, competitiveness and resources. A common demand of the centres we consulted was for greater independence, a wider scope of action to contract new staff, and greater agility in the management of their own resources.

As pointed out in previous chapters, most of the entities in our study followed similar patterns, with similar team composition and organised in the same manner, which made it difficult to differentiate between work frames. In this context, the priorities established by the Head of R&D Area regarding research activity implementation by their groups, or their intention to develop particular R&D activities has been considered an important aspect in determining the way they perform and what really differentiates one centre from another.

To analyse the proactivity of R&D teams within the centres, we did not focus on the characteristics of the R&D teams, which were similar because of the constraints and limitations of the public research system, and with very little discretionary options, but rather on the attention paid by the groups to the development of specific activities. The intentionality of the centres and how Heads of R&D Areas approach these tasks and challenges has been confirmed as a main factor in the proactivity of R&D work groups. Our results clearly support a relation between the priorities established by Heads of R&D Areas and the success of their research teams in terms of international awarded projects. The analysis of the extent to which annual challenges established by Area Heads are prioritised has shown that a lack of prioritisation of activities to be attended to by a group will result in the group being unable to focus their efforts on competitive project applications. Therefore, the amount of projects proposals will be lower and the quality of submitted proposals will be inferior. In R&D centres many activities are the domain of research areas, but if research staff have to undertake a large number of activities at a given moment they will have less time to prepare international grant proposals that meet the tough criteria of excellence expected, including appropriate consortium requirements. In addition, the possibility of making mistakes will increase, and thus the efficacy of the centre will be undermined due to potential project rejections. The way R&D Areas prioritise their annual activities and focus their efforts has been confirmed by our analysis to influence the proactivity of the centre, increasing the number of applications of higher quality and scientific excellence and resulting in higher achieving centres.

The findings of the correlation analysis about the main priorities and challenges of R&D also support these results, since they showed a positive association with the efficacy of the centres in terms of the acquisition of competitive funds. The Pearson correlation coefficient of 0.231 indicated that the most efficient centres were the ones motivated to implement good science and achieve standards of scientific programmes, while the descriptive analysis revealed that obtaining competitive funds in the long term was an enormous challenge for the Heads of R&D Areas. These results are in line with our model, since the development of sound scientific programmes is associated with the quality of the projects the groups are granted. The best R&D projects are usually achieved through international calls, due to the higher amount of available funds, the establishment of lasting collaborative networks and the excellent outcomes derived from the results of these types of projects.

Shifting focus from R&D work teams to research management services as support structures of research staff, our third set of hypotheses addressed the importance of establishing reward policies to increase motivation and performance in organizations, endorsed by the Self-Determination Theory (SDT) approach (Deci and Ryan, 1985a). Since our search of the literature revealed there were not enough studies about the relation between a **reward system and international project application and acquisition in R&D centres**, we have extended previous results beyond the motivation of R&D organization personnel to undertake transfer of technology activities, by analysing rewards and motivations associated with international project applications and achievements by R&D teams. We have considered the way research management structures promote and contribute to performance, paying special attention to the motivations and intrinsic and extrinsic rewards addressed to research management staff, and evaluating the increase of trust among team members and the improvement of results in project acquisition that this brings. We have seen that project management services have become crucial for performance within R&D organizations, both as support structures for research staff and providing cooperation to R&D teams when they apply for competitive calls.

Considering the information collected from personal interviews in the centres visited during the data collection process of our study, there was a pervading perception of insufficient resources for R&D management activities. Some of the institutions in the study have a decentralised office which attends to their network of centres, with a small research management office at each centre in order to deal with the daily needs and project accounting, particularly during the award and post-award phases. In addition, with regards to motivating and promoting international competitive research success ratios and the different incentives and rewards offered to research managers when competitive projects are acquired, our descriptive statistics analysis has shown that extrinsic rewards hardly exist. As occurred with the results obtained for the CEOs regarding incentives policy promoted within their centres, incentives offered by the institutions to promote international projects were glaringly absent in our sample.

Despite previous conclusions, the correlation analysis between centre efficacy and the actions implemented by institutions to improve the success of application and acquisition of international competitive projects –intrinsic motivations and extrinsic incentives offered to research managers when acquiring competitive projects– showed that some extrinsic rewards are positively associated with the efficacy of the centres. Intrinsic rewards were also found to be associated positively with the efficacy of the centres. The Pearson correlation coefficients obtained confirmed that the efficacy of the centre is connected with the incentives research managers can receive when international competitive projects are gained. Our study of the influence of incentives on research organization performance confirms that incentives to Research Management Offices have an effect on the proactivity of R&D groups, but have no bearing on the number of projects awarded to the centre. A reasonable explanation for this finding is that the services provided to research staff are mainly aimed to fulfil (successfully and on-time) the grant application process during the pre-award phase, as the approval or rejection of the submitted proposals are considered to be the responsibility of the R&D groups.

Our study extended the strategic value of the Contingency Approach (Laurence and Lorsch, 1967; Thompson, 1967) though the variable **"workload of Research Management Offices"**. The number and type of tasks developed by the Research Management Offices staff or the workload this structure bears, considered a contingency variable in our research model, was analysed. Workload was understood as the activities research managers perform to assist researchers and the type of services they provide to work teams. The services provided to R&D staff will be different in quantity and nature depending on the number of people work at the Research Management Office, being more or less frequent and intensive according to the human resources available at the office.To identify the type of relationship research managers have with their R&D staff was crucial for our study, and the professionalization and intensity of services provided by Research Management Offices which positively affected the proactivity and efficacy of R&D groups was studied by the amount of personnel at these offices. The correlation analysis of the variable workload of the Research Management Office (information about the services offered by management office staff to researchers when they apply for international competitive projects, in relation to the amount of people work at the office) has allowed us to measure the volume of tasks and activities undertaken by research managers.

The results of our analysis reveal that, equal to priorities established by the R&D Areas and incentives offered to research managers, a greater workload of the Research Management Office will positively influence R&D groups' proactivity and the centre's global efficacy; i.e. centres with a larger volume of research management activities will have more proactive and efficient R&D teams. Thus, our findings suggest that more active Research Management Office staff, with a large volume of tasks devoted to R&D staff, imply more frequent contact and better work relationships with researchers, with the consequential increase of competitive project achievement. Due to this generalised active work of research managers with regards to transfer of technology activities, agreements with external collaborators, clinical trials and observational studies management, etc. as well as project management, research staff are likely to be better informed about funding programmes, open competitive calls, topic procedures, etc. and will be more connected with their colleagues at the offices. As a result of a dynamic portfolio of service activities offered by research mangers to researchers, there will also be an increase of opportunities for R&D staff to be more proactive in the application of competitive projects.

The analysis leads to further suggestions related to the workload variable, which has been shown to be influenced by the size of a centre. From the viewpoint of research management staff, the number of researchers within the R&D groups that constitute the size of the centre, and with whom the Research Management

Office cooperates, has been considered an important variable. In our study, **the number of researchers at the centre is a control variable** that positively and significantly influences the **workload of the Research Management Office**. In fact, a larger number of researchers implies a heavy workload for project managers due to a higher volume of tasks in response to a larger quantity of requests. Research managers will have to provide a greater amount of services and carry out the appropriate follow-up of a higher volume of projects due to the increase of demands from R&D staff.

The number of researchers participating in R&D projects may depend on the researchers who participate in the group; i.e. the size of the R&D teams in their specific areas of knowledge. We have considered the dimension of the research centres in our model, since the number of researchers could affect the amount of projects and activities the entity was capable of developing. But, although our results have shown that the quantity of researchers within a centre has a direct and positive impact on the workload of the Research Management Office, they do not demonstrate an influence on the proactivity of research groups or the number of international projects gained by the centre. This means that the number of researchers within the different groups and R&D Areas and the overall size of the centre do not influence the proactivity of research staff.

Based on the results of our global analyses, the efficacy of a centre is explained by the proactivity of the centre, followed by the workload of the Research Management Offices, the number of researchers in the centre, the incentives offered to Research Management Offices and the priorities of the Heads of R&D Areas. We conclude that the priorities of the Heads of R&D Areas and the workload of Research Management Offices are significantly associated with the proactivity of R&D groups and the efficacy of the centre in question. In addition, our analysis shows that an incentives policy for Research Management Offices is significantly associated with the proactivity of R&D teams, regardless of the size of the centre or the number of researchers it accommodates, which was taken as a control variable. According to Kock (2011:4) “in this case it does not matter whether the effects associated with control variables are significant or not. In models with one main dependent variable, it is advisable to place the control variable on the right side of the model. This improves the readability of the model”.

In the previous chapter we have described findings of other European institutions which also participated in the study and provided us with useful information about their structures, strategy and approaches to dealing with R&D projects. These examples of research organizations in other European countries are as different between them as the Spanish centres in our study. It is not surprising that a large public hospital foundation in Brussels showed similar problems and scientific infrastructures to those of Spanish hospital foundations in our sample. In contrast, the highly specialised Flemish institute, as a basic research centre of excellence, was much more successful in obtaining competitive resources, following a similar pattern to that of some public Spanish institutes that follow private management models for their employment policy and optimal use of resources. The internal organization and approach of European centres could be analysed in future studies through the inclusion of more international public R&D centres to create a more representative international sample with the aim of complementing the current vision of the public Spanish R&D model and moving toward a more comprehensive and ambitious study.

Our results have implications for business management, since knowing how to implement measures to take advantage of the available international programme in order to improve competitive funds acquisition is a key issue for any institution aiming to get ahead in knowledge-based economies. Therefore, the implementation of the proposed organizational factors may have an added value for current investigations in relation to both R&D group performance and research management staff services, given their relevance, novelty and applicability. Our results may also have implications for policymakers, since they are valid for European countries performing below international expectations in terms of their R&D national systems and which wish to reinforce their internationalization parameters, as in the case of Spain (European Commission, 2014, 2014a).

7.2. LIMITATIONS OF THE STUDY

This study has a few limitations, since the empirical analysis has been implemented through a small sample of 68 public R&D centres in a specific field; namely that of Biomedicine and Health. This was due to the need to focus the research as much as possible because of the novelty of the topic and the complexity and diversity of the data collected.

During the planning of the study, several meetings were arranged and fluid contact was maintained with personnel from the DGCYT of MINECO, the European Office of FECYT and CDTI. They showed a keen interest in our study as a means of acquiring knowledge with which to improve Spanish public R&D policies in relation to international funding performance, and were willing to actively support the project and take advantage of its development and results.

As explained in previous chapters, the most valuable information to obtain from these institutions was the amount of European projects applied for by and awarded to Spanish R&D entities, together with their support. In particular, we needed objective data about the aforementioned international projects applied for by and granted to the public centres included in our sample. A historic list was available but not structured, and so we discussed a possible collaboration between our institutions in order to assist them with the extraction and classification of this information. We were also interested in general data the Ministry may have had in terms of projects applied and gained, programmes awarded, etc. A deep understanding of the success factors in international fund acquisition was only going to be possible if a high response rate was achieved from the participant centres. Support from the State organisms consulted and a complete information were also crucial for the legitimacy of the study and for the perception of the centres about the necessity to participate. The main results offered by the study were the following:

- Ranking of effectiveness in project achievement. More complete if the sample included the entire population.
- Knowledge of the success factors in project acquisition:
  - Structure of the most successful research teams.
  - Role of the Director or TMT of the centres in this success: policies, priorities, incentives, etc.; perception of R&D teams and perception of management; relationship with the characteristics of the CEO or Director of the centre.
  - Role of Project Management Offices: structure of offices and characteristics of their members; list of offices with R & D teams.
- Benchmarking with international R&D centres. Strategic profile (comparative) between the R&D organizations.

MINECO and ISCIII may benefit from this study by obtaining a ranking of centres by effectiveness in terms of project applications and formal criteria for assessing the potential of research teams, policies or guidelines for structure improvement, etc. For this aim, it was very important to reach an **'objective' measure** not provided by the centres themselves. Thus, the number of projects by institution was the dependent variable in our study (proactivity and efficacy), and the viability of the study depended on gaining access to these data. Moreover, it drastically would reduce the data collection costs, in time and money.

The information concerning our dependent variables was compiled in the national database CORDA, which is managed by CDTI and which included Spanish participation in the 7th Framework Programme 2008-2013. Unfortunately, it was not possible for us to obtain a licence to consult this database. We gained access to information about projects awarded to beneficiaries as coordinators and partners, but not regarding the number of projects applied for per beneficiary and without differentiating specific programmes within the 7th Framework Programme Health Sciences Area. Although we received support and interest in our study from the National R&D Spanish policymakers in Science and Innovation, it was not possible for them to give us access to the CORDA database. We were unable to contrast our dependent variable of applied for and awarded projects by the centres in our sample with the official figures of the Spanish Ministry of Economy, Industry and Competitiveness. This was an important limitation for our study. In addition, the process of gaining access to the official information of CDTI took us more than 1 year. Data collection for the study suffered a delay of one year and a half, since we could not design the questionnaires and begin the surveys until the nature and quantity of available information resources were clarified.

We finally obtained information about competitive projects from the surveys addressed to the Research Management Offices of the centres in global figures. The official data about projects of CDTI could have allowed us to have a larger sample, and valid information about all the R&D Areas of the centres. During our primary data collection process, not all the R&D Areas of each entity responded to the questionnaires; hence, the data of the Research Support Area Director questionnaire has not been used to their full potential. Due to the lack of information within some centres, we have not been able to compare data from different R&D Areas of the same centres.

Another limitation of the study is related to the Head of R&D Areas, since sometimes they were also the person responsible for a research line within the Area. These Heads answered the questionnaires on behalf of their work group, but could not respond for the entire Area, which often included numerous different research teams. To avoid confusion, and since all Heads were responsible for at least one or more R&D groups, we considered all the respondents to have the same level of responsibility, since it was not possible to collect information from all the work groups of all the Areas for each centre. The aggregated information concerning competitive projects for all the centres was extracted from the surveys addressed to the Heads of the Research Management Office.

We consider that information on the results of Spanish institutions in the realm of competitive research projects should be public, as is the case in other European countries. It seems not reasonable that these results are not accessible to researchers carrying out rigorously performed university-backed projects like the present one. This type of study is very limited and costly in terms of time and resources, and Spanish authorities should view them as a convenient and useful opportunity to supply academics, researchers, and public institutions like universities, research centres, etc. that have a vested interested in R&D project performance with official information that can help to ensure the continuation of research and progress in this field.

Quantitative, comparable and robust data are still needed to increase our understanding and tracking of the arrangements and social and economic implications of our results. However, qualitative studies will be also required to further our knowledge of the performance of research organizations on the international R&D stage, and to provide objective insights to overcome superficiality and data collection bias.

7.3. FUTURE RESEARCH LINES

With regards to future research, this study hopes to have illuminated at least one significant part of the long pathway to the successful acquisition of competitive funds, but we recognize that there are other factors which could also influence this success.

Further research should be carried out in other areas (ICT, Environment, Security, New Materials, etc.) to explore how the model we propose for use in the field of Biomedicine and Health could contribute to outcomes in those areas. In addition, the variables we have analysed could represent the starting point for new research lines. In this way, these relationships could be evaluated and extended further by considering other questions, such as the influence that general policies in R&D centres can have on the proximity or distance between work groups and their interactions, which are dealt with next in this chapter.

The structure, **characteristics and diversity of research teams** are potential key variables that influence goals when applying for competitive funded projects. A team's previous experience in international projects, the researchers' curriculum vitae and background, potential alliances and established R&D networks, the PI's reputation, and also the efficacy of their processes are likely to influence outcomes, since any one of these factors may increase the chances of obtaining cooperative projects. Indeed, following Hambrick and Mason (1984), Carpenter et al. (2004) and Hambrick (2007), demographic profiles of individuals and work groups within organizations reflect their cognition, values and perceptions and, hence, the organization's strategic choices and its groups' final performance. The study of individual demographic characteristics and the R&D team's characteristics (composition, structure, diversity, etc.) could be a crucial point for evaluating efficacy in terms of the outcomes of the work group and the global performance of the whole centre.

Following the previous argument, some internal factors that may affect R&D teams' performance within research institutions are related to the characteristics and composition of work teams and managerial departments within the organization. Characteristics of research management offices, including their staff's education, background, diversity, values and motivations, the efficiency of processes and support activities aimed towards the R&D groups, interaction with international funding agencies and with other groups from outside and inside the organization, and their client orientation profiles. All these variables could impact a centre's R&D work group activities and influence the overall efficacy of the centre. Thus, some **demographic characteristics may influence the efficiency of the services research management staff** provide to researchers, and the quality of the services is likely to allow researchers to gain more resources from competitive sponsored projects. A future research line arises here in terms of how the **diversity of research management offices** may moderate researchers' success in the acquisition of international competitive funds.

Chapter three of the study has focused on the analysis of internal factors that may affect R&D teams' performance within research institutions. In addition, reviewing recent research about work groups' efficacy highlighted the importance of implementing efficient processes for a proper performance in organizations, which also may apply to R&D institutions. In particular, we have mentioned a variable that could influence R&D groups' performance and which relates to the **support research groups can receive from the managerial structures of the organization, like the Director of the research centre and the TMT** (Heads of the Research Areas). Thus, organizational support offered to the R&D groups could be studied in order to explore how it may moderate success in international competitive fund acquisition.

In addition, and also in line with our review of the literature regarding the efficacy of work groups within R&D centres and our analysis of how internal factors effect success, the demographic characteristics of research management office staff could also be studied by focusing on their similarity (or distance) with respect to the demographic characteristics of the R&D work teams. Such a future study may show how these observable variables and the existing similarities between both work groups and management office staff may influence the final performance of researchers. The study of the **proximity between R&D team members' characteristics and those of research management staff** in efficient R&D organizations –alignment of the support and administrative staff characteristics with the centre's research areas or departments– may be of interest, since this proximity could also impact the relationship between R&D groups and their efficacy. Thus, to evaluate TTOs teams' efficacy, it is important to assess the proximity that research managers and administrators have with the project research areas they manage. This would involve analysing the alignment of research managers and administrators with the research fields of the centre and technical knowledge about the research groups' investigations, which is sure to create proximity with the researchers and hence influence in a particular way their relations and their performance.

Another variable to be analysed in future studies is the connection between Research Management Offices and R&D teams in terms of the familiarity of research management staff with the areas of knowledge they interact with. In the same way, the alignment between Research Management Offices members and researchers, and their technical knowledge about the research groups' work, could be important aspects to analyse, as they can create a feeling of proximity with the researchers, and hence influence the quality of the relations between these groups, improving the R&D groups' final performance. Indeed, the proximity that may arise due to a better understanding of the R&D management offices about the projects they manage may increase the quality of the services they offer to researchers. This could also influence the nature of interactions between both parts of the centre's structure in terms of fluency and quality, thus determining the importance and usefulness of the support researchers receive from their R&D management services. The study could illustrate how R&D groups can interact closely with research management staff in order to maximize their chances of obtaining international sponsored projects; in other words, to what extent **the intensity of the relationship between R&D groups and research management** staff is a mediating factor in the efficacy of a centre.

The diversity of work groups is another important future focus of study, and in particular the study of faultlines within work groups, which we consider to be of great interest but have not explored in depth in the present study. Studies about group diversity have attempted to determine the influence of group composition in group-level performance, and this is increasingly accepted as an important characteristic of teams in organizations. However, diversity has been recognised to have both positive and negative effects on team performance, and the method of studying and managing diversity aims to better understand these effects. **The development of faultline theory** (Lau and Murnighan, 1998) responds to this question, since it proposes that the negative influence of team diversity is better understood when we consider the influence of different dimensions of diversity together instead of considering independently the influence of each dimension. The faultlines theory provides a complementary and more sophisticated conceptual approach to team diversity that goes beyond simple distribution to address mixed results. The faultlines view holds that work team members simultaneously differ in several dimensions (gender, expertise, etc.) and that the effects of a specific dimension can be contingent on others and are defined as “hypothetical dividing lines that may split a group into subgroups based on one or more attributes” (Lau and Murnighan, 1998; Rico et al. 2012; Thatcher and Patel, 2011; Thatcher and Patel, 2012). Team members who share analogous demographic characteristics create homogeneous subgroups within a group. Composite faultlines are concurrent divides among several patterns of basic attributes. The most common attributes in faultline composition are sex, race, functional background, tenure, age, educational background, geographic work location, and personality. Since work groups may vary in a wide range of dimensions, faultlines represent the basic feature of a team’s configuration. If alignment on multiple dimensions increases the salience of subgroup categorizations, faultline researchers suggest that faultlines are better predictors of processes and group and organization performance than diversity variables, which are based on dispersion theories (Bezrukova, Thatcher, Jehn and Spell, 2012).

Group faultlines are the demographic location of members along numerous attributes within a group, and the concept of faultline strength or the degree of a demographic alignment across members within a group has also been studied (Zanutto, Bezrukova and Jehn, 2010). Team processes and outcomes are highly influenced by subgroups. In one important stream of research, scholars studying faultlines have clarified that subgroups emerge from characteristics related to team composition (Carton and Cummings, 2012). The configurational properties of a group or the number of subgroups in a team and the variation of size of subgroups within a team are important drivers of team outcomes.

Van Knippenberg, Dawson, West and Homan (2011) extended the social categorization analysis of faultline theory with the objective of identifying a factor that reduces the negative influence of faultlines produced when the work team share the same objectives. Shared objectives may make the shared team membership more salient and subgroupings less salient by reaching a more shared and adaptive understanding of team process and goals, there by dismissing the relationship between faultlines and entity performance, (Van Knippenberg et al. 2011).

From the TMT perspective (Hambrick and Mason, 1984), faultlines are a negative influence on the performance of the entire organization (Li and Hambrick, 2005). The literature establishes relations between (TMT) faultlines and objective indicators of organizational goals (Van Knippenberg et al. 2011). Indeed, since organization performance within the Upper Echelon Theory is a reflection of the TMT's characteristics and performance, such divides may have a negative impact on the global entity's capability to perform. Thus, factional groups pre-exist and, while TMTs may not be much different from other work groups analysed in diversity research, TMT diversity is of particular interest because it can be studied with respect to the performance of the organization as a whole (Carpenter et al. 2004; Hambrick and Mason, 1984), highlighting relationships between faultlines and organizational target indicators of performance.

The empirical methods used to measure faultlines have largely focused on two aspects: faultline strength and faultline distance (Thatcher and Patel, 2012). The concept of faultline strength has been defined as the level of demographic alignment across members within a group (e.g., Lau and Murnighan 1998; Thatcher, Jehn and Zanutto, 2003). The strength of a group faultline increases as the amount of attributes along which two subgroups are aligned increase, and it establishes how many demographic attributes align within a group (similarities) or how easily a work group may divide into two homogeneous subgroups. Thus, faultlines vary in strength based on the homogeneity of the subgroups. When multiple attributes of a team group align, the faultlines are considered stronger due to the fact that the differences between subgroups become more visible for comparison between team members. When categories become significant and faultlines are activated, coalitions may split the work team. In this case, subgroup biases make individuals help and trust their subgroup members more than external subgroup biases, boosting group divergences that interfere with information use scope and depth, block communications, and hinder the arbitration of common agreements. This also brings into question the benefits derived from differing sources of task-relevant knowledge, which decreases both team performance and satisfaction (Rico el al. 2012).

If demographic faultlines are a form of team configuration and clearly matter for teams above and beyond the effects of demographic diversity, these results should reassure researchers that the study of demographic faultlines is relevant for teams, and that more research on faultlines of all types would be convenient. Since teams are an essential part of organizational environments; the more we understand about team functioning, the more we can effectively guide organizational teams (Thatcher and Patel, 2011). Although most faultlines studies has carried out by researchers interested in diversity and teams, future studies on faultlines could be important to researchers in the fields of power, alliances, subgroups, social networks, intergroup behaviour, conflict, learning, and decision-making (Thatcher and Patel, 2012), in which our study may be included.

Although our study has analysed performance in R&D competitive fundraising by research work groups, it could be extended to focus on specific support services within R&D centres that are usually included among Research Management Office activities, or are developed by independent departments within the management structures of the centre. An example of these new approaches would be to study the increase and improvement of transfer of technology outcomes of public R&D centres and university R&D groups (impact of R&D results and innovation actions in society) and how R&D groups receive real support from their TTOs in all phases, so that research can respond to the market and make economic profits. This would allow other researchers to perform interdisciplinary research to enhance understanding of this novel and relevant subject and maximise its contributions to the field.

Capítulo 7

Discusión de los resultados y conclusiones

7.1. PRINCIPALES CONTRIBUCIONES E IMPLICACIONES

Este estudio intenta explicar cómo y por qué ciertos factores, considerados por la literatura de gran influencia en la eficacia de los grupos de trabajo (Choi et al. 2003, Lin et al. 2005), afectan al éxito que los equipos de I+D tienen a la hora de conseguir financiación competitiva internacional, dentro de instituciones de investigación públicas españolas sin ánimo de lucro. La investigación ha planteado distintas proposiciones basadas en la literatura científica existente sobre programas de financiación competitiva internacional (Gabriele, 1998; Galsworthy y McKee, 2013; Grimpe, 2012; Kirby, 1992; Laudel, 2005, 2006), sobre la eficacia de grupos de trabajo en organizaciones públicas de I+D (Choi, Price y Vinokur, 2003; Lin, Yang, Arya, Huang y Li, 2005), y sobre las estructuras de gestión que asisten y apoyan a los citados equipos de I+D (Connell, 2004; Kennedy et al. 2009; Kirkland, 2005; McCallister y Miller, 1993).

Este trabajo de investigación ha contribuido a ampliar los conocimientos actuales sobre la eficacia de los grupos de trabajo, proponiendo un enfoque novedoso que conecta tres teorías clave ampliamente aceptadas por la literatura: la Visión Selectiva de la Atención (Barnett, 2008; Barreto y Patient, 2013; Cho y Hambrick, 2006; Kahneman, 1973; Kaplan, 2008; Ocasio, 1997, 2011); la Teoría de la Autodeterminación o Motivación en la empresa (Deci y Ryan, 1985a; Eby, Freeman, Rush y Lance, 1999; Gagné y Deci, 2005; Ryan y Deci, 2000; Thomas y Velthouse, 1990); y la perspectiva de la Contingencia (Drazin y Van de Ven, 1985; Lawrence y Lorsch, 1967; Thompson, 1967; Zeithaml, Varadarajany y Zeithaml, 1988), con el fin de comprender mejor qué influye en la proactividad y la eficacia de los investigadores a la hora de conseguir proyectos internacionales en convocatorias competitivas, y la influencia que las oficinas de gestión de la investigación o departamentos de proyectos pueden tener en este éxito dentro de los centros españoles de I+D+i.

La proactividad de los equipos de I+D se ha medido por la cantidad de proyectos solicitados por parte del personal investigador, considerando tanto el número de proyectos internacionales solicitados, como el montante económico global de financiación solicitada a los principales programas internacionales. En cambio, la eficacia de los centros ha sido medida por el número de proyectos internacionales conseguidos por estas instituciones, tanto en el montante de proyectos competitivos obtenidos, como en la suma económica total de fondos obtenidos por cada centro. El estudio ha demostrado que la proactividad de los grupos de I+D, es decir, la solicitud de proyectos a financiación competitiva internacional, está directamente relacionada con la eficacia del centro, estando la capacidad de obtener recursos competitivos positiva y significativamente asociada con el número de proyectos solicitados a las principales agencias de financiación europeas. Esto no es sólo debido a que los equipos de I+D tienen más posibilidades de obtener fondos si solicitan este tipo de proyectos, sino porque es de esperar que el personal investigador que solicita proyectos sea más eficaz que aquéllos que nunca solicitan financiación de esta índole.

La solicitud de proyectos internacionales puede llegar a ser un proceso largo y complejo y, en la mayoría de las ocasiones, los investigadores encuentran difícil seguir la normativa internacional y cumplir con los requisitos burocráticos que establecen las distintas convocatorias. Asimismo, encontrar la red adecuada de socios extranjeros –el consorcio internacional– que se necesita en la mayoría de estas convocatorias, puede ser un problema para los Investigadores Principales (IP), si no están acostumbrados a cooperar en el ámbito internacional y no han establecido contactos previos con grupos externos en su campo de actuación. Además, la tasa de éxito de las propuestas de proyectos depende de los fondos anuales de los que disponga el programa, el tipo de proyecto o acciones –esquemas de financiación– y el presupuesto previsto para cada temática (número de proyectos a conceder establecido a priori en cada una de las temáticas), entre otros parámetros.

Según las últimas estadísticas ofrecidas por el Programa Horizonte 2020 para el 2017, la tasa actual de éxito global de las propuestas admitidas a financiación está alrededor del 14%, en comparación con el 20% que hubo previamente para todo el 7º Programa Marco, puesto que la mayoría de los proyectos subvencionables no llegan a financiarse, dado el exceso de solicitudes admitidas a financiación en relación al presupuesto disponible para los diferentes programas, y las restricciones inicialmente publicadas en las convocatorias en cuanto a la cantidad real de proyectos a financiar. A pesar de ello, los investigadores que han solicitado proyectos internacionales sin éxito, y que siguen intentándolo después de varias denegaciones, pueden mejorar sus futuras solicitudes incorporando la valiosa información que los revisores proporcionan y las evaluaciones de los funcionarios de la Comisión Europea, aprovechando así las propuestas de mejora y el mejor conocimiento que tendrán de las reglas de juego para cada programa. De esta forma, pueden aumentar sus posibilidades de conseguir un proyecto competitivo en próximas convocatorias, puesto que volviéndose a presentar en nuevas ocasiones con un conocimiento mayor de los procedimientos generales de financiación, aumentarán sus posibilidades de conseguir el proyecto solicitado. Se ha confirmado que los investigadores proactivos serán más eficaces o exitosos que los menos proactivos dentro de los equipos de I+D. Sin embargo, aunque la proactividad es una variable asociada a la eficacia de los centros, los investigadores menos exitosos, con el tiempo pueden volverse menos proactivos. Este importante efecto también debe ser tenido en cuenta y analizado cuando se estudie la eficacia en la adquisición de proyectos competitivos, aunque para nuestro estudio hayamos asumido que la mayoría de los centros proactivos son los más eficaces. Las instituciones de I+D más exitosas serán aquéllas con mayor participación en convocatorias competitivas de I+D, es decir, las que presenten un mayor número de solicitudes de proyectos a los diferentes programas internacionales.

El estudio se ha basado en la teoría de la Atención de la Empresa (ABV) (Ocasio, 1997, 2011) para plantear un marco potencialmente explicativo, pues se ha confirmado que la **priorización de las actividades de I+D por parte de los Jefes de las Áreas de Investigación** de los centros, influye en la proactividad de sus grupos de trabajo y en la eficacia general de sus instituciones, tal y como se había planteado en las hipótesis 2a y 2b de nuestro modelo. La ABV ha evidenciado el papel que la capacidad de atención de los equipos directivos tiene para que éstos desarrollen ciertas actividades relacionadas con la búsqueda y consecución de proyectos competitivos internacionales, entre otras. Hemos contribuido al avance de esta Teoría, pues las prioridades que los Jefes de las Áreas de I+D puedan establecer respecto a las actividades anuales a desarrollar por sus equipos o grupos de trabajo, se ha demostrado crucial para conocer cómo se comportan los centros de investigación y en qué aspectos estas organizaciones difieren unas de otras.

Los Responsables de las Áreas de I+D de los centros del estudio –coordinadores de las diferentes líneas y grupos de investigación– son quienes establecen el tipo de actividades que desarrollarán sus equipos y las prioridades del grupo o grupos de I+D a corto y medio plazo. También son ellos los que toman decisiones sobre qué actividades son prioritarias sobre otras, y en qué tareas los equipos centrarán sus esfuerzos con mayor intensidad y con un mayor uso de los recursos disponibles. En el marco de nuestro estudio, la solicitud y adquisición de fondos competitivos es una de las diferentes actividades que los grupos de I+D pueden desarrollar. La proactividad y la eficacia de estos equipos será una actividad más o menos prioritaria para ellos dependiendo de la importancia y el apoyo que el Jefe del Área otorgue a esta actividad, en comparación con otras que pueda haber dentro del grupo, todas ellas realizadas por los equipos de I+D con el fin de cumplir con los objetivos del Área y los resultados anuales marcados, presumiblemente alineados con los planes de acción y la política general de I+D del centro. El conocimiento de las principales prioridades establecidas por los Jefes de Área de I+D nos ha proporcionado información importante sobre la atención que el personal de investigación está prestando a este objetivo, y la influencia que esta priorización tiene sobre la proactividad y la eficacia global de sus instituciones.

Durante el desarrollo de esta investigación hemos podido comprobar que el sistema público español es restrictivo y que la mayoría de las instituciones de nuestra muestra mostraban patrones similares en su política de incentivos y de contratación de personal de investigación. Con el sistema público existente, tan restrictivo para la mayoría de los centros de I+D, se nos puso de manifiesto que los centros analizados tienen estructuras similares, con poco margen de maniobra para promover contrataciones de personal y motivar a sus trabajadores mediante una política interna de incentivos. De hecho, durante el proceso de recopilación de datos primarios, lo entrevistados manifestaron la limitada libertad de movimiento que tienen para decidir y contratar personal de investigación. Incluso habiendo suficiente presupuesto disponible para contratar nuevo personal, algunos centros públicos sólo pueden contratar personal –principalmente funcionarios públicos– de su propia red de centros, al pertenecer a la Administración General del Estado. Contando con suficientes fondos para contratar investigadores cualificados, los contratos en la mayoría de estas instituciones se hacen a través de ofertas públicas de empleo, muchas veces dentro de su propia red de investigadores, y con poca agilidad, debido a los requisitos que han de cumplirse en los procedimientos estatales. Hay poca libertad de acción y poder de decisión sobre a quién contratar. Las vacantes de empleo para personal de I+D (incluso si el centro ha conseguido dinero de proyectos, convenios o acuerdos de cooperación, etc.) tienen que superar varios procesos de aprobación. Los procedimientos públicos suelen llevar mucho tiempo para los plazos que manejan los proyectos competitivos, que son ajustados en tiempo y requieren respuestas rápidas. Los IP muchas veces no son capaces de contratar al personal de investigación en el tiempo requerido, perdiendo no solo la oportunidad de incrementar su plantilla, sino competitividad y recursos económicos. La demanda más común de estos centros era tener más independencia, con un mayor y más rápido poder de acción para contratar nuevo personal y una agilidad mucho más grande para gestionar sus propios recursos.

Como ya se ha mencionado en capítulos anteriores, la mayoría de las entidades del estudio mostraron patrones de comportamiento similares, con una composición de equipos análogos, estando organizados de forma parecida, no siendo posible diferenciar de forma clara sus ámbitos de actuación a nivel interno. En este contexto, las prioridades establecidas por el Jefe del Área de I+D en cuanto a la implementación de actividades de investigación por parte de sus grupos, o su intención de desarrollar algunas actividades específicas de entre las posibles tareas de I+D, se ha considerado una cuestión importante de estudio para averiguar su desempeño y en qué se diferencian realmente los centros, independientemente de sus ámbitos o campos de investigación.

Para analizar la proactividad de los equipos de I+D dentro de los centros, no nos fijamos en las características de los equipos de I+D, los cuales aparecen similares por las limitaciones ya comentadas del sistema público de investigación y con pocas opciones discrecionales, sino que nos fijamos en la atención que los grupos de investigación prestan al desarrollo de determinadas actividades específicas. La intencionalidad de los centros y el enfoque que los Jefes de las Áreas de I+D pueden dar a estas tareas y desafíos para sus propias áreas, ha sido confirmado como un factor fundamental para evaluar la proactividad de los grupos de trabajo de I+D. Los resultados obtenidos confirman claramente la relación que existe entre las prioridades establecidas por los Jefes de las Áreas de I+D y el éxito de sus equipos de investigación, en términos de proyectos internacionales conseguidos. El análisis del grado de priorización que los Jefes de las Áreas de I+D dan a los retos y metas a alcanzar anualmente por sus grupos, ha demostrado que si no existe una clara priorización de las actividades a las que el grupo o grupos se dedicará, hará que éstos no puedan concentrar sus esfuerzos en solicitar proyectos competitivos. Por lo tanto, la cantidad de solicitudes de proyectos será menor y/o el número de propuestas presentadas será de calidad inferior. En los centros de I+D, las áreas de investigación deben atender y desarrollar muchas actividades, pero si el personal de investigación tiene que hacer frente a un gran número de actividades al mismo tiempo, tendrán menos tiempo para preparar propuestas internacionales cumpliendo con las normas de excelencia requeridas y habiendo constituido el consorcio adecuado. Además, la posibilidad de cometer errores en el proceso de solicitud aumentará, por lo que la eficacia del centro debido a las denegaciones de los proyectos se verá reducida. Nuestro análisis ha comprobado que la forma en que las áreas de I+D priorizan sus actividades anuales y centran sus esfuerzos influye en la proactividad del centro, aumentando la cantidad de solicitudes con una mayor calidad y un mayor nivel de excelencia científica.

Los resultados obtenidos en el análisis de correlaciones sobre las principales prioridades y desafíos de investigación dentro de las Áreas de I+D, también apoyan estos resultados, pues se demostró la asociación positiva entre éstas y la eficacia de los centros en términos de adquisición de fondos competitivos. El coeficiente de correlación de Pearson de ,231 indicó que los centros más eficientes son los que están más motivados para establecer buenos programas científicos anuales que les permitan desarrollar buena ciencia, aunque en el análisis descriptivo, obtener financiación por proyectos competitivos a largo plazo es uno de los principales desafíos para los Jefes de las Áreas de I+D. Estos resultados tienen sentido con el modelo que hemos planteado, pues el desarrollo de buenos programas científicos puede estar asociado a la realización de proyectos de alta calidad que los grupos pueden obtener. Los mejores proyectos de I+D se logran generalmente a través de convocatorias de investigación internacionales, debido a la mayor cantidad de fondos disponibles que tienen estos programas, al establecimiento de redes colaborativas duraderas de excelencia, y a las aplicaciones derivadas de los resultados que suelen obtenerse en este tipo de proyectos colaborativos.

Pasando de los equipos de I+D a los servicios de gestión de la investigación, como estructuras de apoyo al personal investigador en los centros de I+D, nuestro tercer grupo de hipótesis (H3a y H3b) analizaba la importancia que tiene establecer políticas de incentivación para aumentar la motivación y los resultados de estas organizaciones, enfoque argumentado por la Teoría de la Autodeterminación o Motivación en la empresa (SDT) (Deci y Ryan, 1985a). Dado que no hay suficientes estudios sobre **políticas de incentivos en organizaciones de investigación asociadas a la solicitud y adquisición de proyectos internacionales en centros de I+D**, nuestra investigación ha ampliado los resultados actuales, más allá de las motivaciones e incentivos del personal de entidades de I+D relacionados con actividades como la transferencia de tecnología, al analizar los incentivos extrínsecos y las motivaciones intrínsecas asociadas a las solicitudes de proyectos internacionales y los logros alcanzados por los equipos solicitantes. Hemos considerado el modo en que las estructuras de gestión de la investigación promueven y contribuyen a estos resultados, prestando especial atención a las motivaciones y las recompensas extrínsecas e intrínsecas dirigidas al personal de las oficinas de gestión de proyectos, y evaluando el aumento de la confianza que se produce entre sus miembros y la mejora de los resultados en la concesión de proyectos. Asimismo, hemos visto que los servicios de gestión de la investigación se han convertido en piezas fundamentales dentro de las organizaciones de I+D para alcanzar un rendimiento óptimo, constituyéndose como estructuras de apoyo para el personal de investigación, que cooperan con los equipos de I+D cuando éstos solicitan proyectos a las diferentes convocatorias competitivas.

En base a la información recogida durante las entrevistas personales mantenidas en los centros mientras duró el proceso de recolección de datos de nuestro estudio, la percepción de que no hay suficientes recursos para actividades de gestión de la I+D+i fue un comentario habitual. Algunas de las instituciones del estudio cuentan con una oficina central que da servicio a toda su red de centros públicos, quedando en los centros tan sólo un pequeño servicio de gestión de la investigación para atender las actividades administrativas más esenciales y llevar la contabilidad de los proyectos, principalmente durante las fases de ejecución y resultados. Adicionalmente, en lo que respecta a la motivación e incentivación para mejorar el ratio de éxito en la consecución de financiación competitiva internacional, y los diferentes incentivos y recompensas ofrecidas a los gestores de investigación cuando se consiguen proyectos competitivos, nuestro análisis estadístico descriptivo ha demostrado que los incentivos extrínsecos apenas existen. Como ocurrió con los resultados obtenidos para los Directores de los centros respecto a la política de incentivos promovida en sus instituciones, los incentivos potenciales que podrían poner en práctica los centros de investigación para aumentar la adquisición de proyectos internacionales, apenas se da en nuestra muestra.

A pesar de las conclusiones anteriores, el análisis de correlación entre la eficacia del centro y las acciones implementadas por las instituciones para mejorar la solicitud y concesión de proyectos competitivos internacionales –motivaciones intrínsecas e incentivos extrínsecos ofrecidos a los gestores de investigación si los grupos de I+D consiguen proyectos competitivos– demostró que algunos incentivos extrínsecos están asociados con la eficacia del centro. De igual forma, los incentivos intrínsecos también han sido positivamente asociados con la eficacia del centro. Efectivamente, los coeficientes de correlación de Pearson obtenidos en el análisis estadístico confirmaron que la eficacia del centro está relacionada con los incentivos que los gestores de investigación pueden recibir cuando se obtienen proyectos competitivos internacionales. Los resultados de nuestro estudio confirman que los incentivos ofrecidos al personal de las oficinas de gestión de proyectos influyen en la proactividad de los grupos de I+D, aunque no mostraron ninguna significación en el número de proyectos conseguidos por el centro. Una explicación razonable a este resultado es que los servicios prestados a los investigadores por parte de la oficina de gestión de proyectos están dirigidos principalmente a cumplir (con éxito y en tiempo) el proceso de solicitudes de propuestas durante la fase de pre-adjudicación, considerándose la concesión o denegación de los proyectos solicitados una responsabilidad más directa del IP o del grupo que ha solicitado el proyecto.

Los resultados obtenidos también han ampliado el enfoque que ofrece la Perspectiva de la Contingencia (Laurence y Lorsch, 1967, Thompson, 1967), mediante el análisis de la variable **“carga de trabajo” en las oficinas de gestión**

de la investigación. Nuestro estudio ha analizado el número y el tipo de tareas desarrolladas por el personal que trabaja en estos departamentos, es decir, el volumen de trabajo que esta estructura soporta, y que se considera una variable de contingencia en el modelo de investigación propuesto. La carga de trabajo se entiende como las actividades que los gestores de proyectos de investigación desarrollan para ayudar a los investigadores, y el tipo de servicios que proporcionan a los equipos de I+D. Los servicios ofrecidos al personal de I+D serán diferentes en cantidad y naturaleza dependiendo del número de personas que trabajen en la oficina de gestión de la investigación. Podrán ser más o menos frecuentes y personalizados, según los recursos humanos disponibles que puedan dedicarse a actividades de gestión de I+D. Identificar la relación que el personal de gestión puede mantener con los investigadores fue crucial para nuestro estudio, así como medir el grado de profesionalización e intensidad de los servicios prestados por las oficinas de investigación, los cuales se ha demostrado afectan positivamente a la proactividad de los grupos de I+D y a su eficacia, y que fueron medidos atendiendo a la cantidad de trabajo respecto a la cantidad de personal de estas oficinas. El análisis de correlación de la variable de la carga de trabajo en las oficinas de gestión de la investigación –información sobre los servicios del personal de la oficina de gestión a los investigadores cuando solicitan proyectos competitivos internacionales, en relación con la cantidad de personas que trabajan en las oficinas– nos ha permitido medir la cantidad de tareas y actividades de los gestores de investigación.

Los resultados de nuestro análisis han revelado que, con unas prioridades establecidas por las Áreas de I+D similares en los centros de investigación y una política de incentivos ofrecidos a los gestores de investigación equivalentes en todos ellos, un mayor volumen de trabajo en las oficinas de gestión de la investigación influirá positivamente en la proactividad de los grupos de I+D y la eficacia general del centro. Esto significa que los centros con una mayor cantidad de actividades de gestión de la investigación tendrán equipos de I+D más proactivos y eficientes. Nuestros hallazgos sugieren que las personas más activas trabajando en las oficinas de gestión de la investigación, con una gran cantidad de tareas y actividades dedicadas al personal de I+D, tendrán relaciones más frecuentes y de mejor calidad con los investigadores, con el consecuente aumento de tareas enfocadas al logro de solicitudes de proyectos competitivos. Debido a este trabajo generalizado y activo de los gestores de proyectos en su actividad habitual, como son la transferencia de actividades tecnológicas, la gestión de acuerdos con colaboradores externos, los ensayos clínicos y gestión de estudios observacionales, etc. incluyendo también la gestión de proyectos de I+D, el personal investigador estará mejor informado sobre los programas de financiación existentes, las convocatorias competitivas abiertas, los procedimientos de trabajo a seguir de acuerdo a los distintos esquemas de financiación, etc. y estarán más conectados con sus colegas de las oficinas de gestión de la investigación. Como consecuencia de que los gestores dispongan de una cartera de actividades y servicios más dinámica hacia los investigadores de su centro, las oportunidades para que el personal de I+D sea más proactivo en la solicitud de proyectos competitivos también aumentarán.

Los resultados de nuestro análisis conducen también a nuevas recomendaciones en relación a la carga de trabajo, que ha demostrado estar influenciada por el tamaño de los centros. Desde el punto de vista del personal de gestión de la investigación, la cantidad de investigadores pertenecientes a los grupos de I+D, que constituyen el tamaño del centro y con los que los gestores de investigación colaboran, se ha considerado una variable importante. En nuestro estudio, el **número de investigadores que hay en los centros es una variable de control** que influye positiva y significativamente en **la carga de trabajo de las oficinas de gestión de la investigación**. De hecho, un mayor número de investigadores en los centros implicará una mayor carga de trabajo para los gestores de proyectos, debido al aumento de las tareas que éstos tendrán que realizar para cumplir eficazmente con el mayor número de servicios solicitados. Los gestores de investigación tendrán que proporcionar una mayor cantidad de asesoramiento, apoyo, búsquedas de información, etc. y hacer el seguimiento adecuado de un volumen de proyectos más elevado, dado el incremento de las peticiones de sus servicios por parte del personal investigador del centro.

La cantidad de investigadores que participan en proyectos de I+D puede depender de los investigadores que integran los grupos, es decir, del tamaño de los equipos de I+D en sus áreas de conocimiento específico. La dimensión o el tamaño de los centros de investigación ha sido considerada en nuestro modelo, pues el número de investigadores podría afectar la cantidad de proyectos y actividades que la entidad sea capaz de desarrollar. Sin embargo, aunque los resultados han demostrado que la cantidad de investigadores dentro de los centros tiene un impacto directo y positivo sobre la carga de trabajo de las oficinas de gestión de la investigación, no se ha demostrado su influencia sobre la proactividad de los grupos de I+D, ni sobre la cantidad de proyectos internacionales conseguidos por el centro. Esto significa que el número de investigadores que componen los diferentes grupos y áreas de I+D y, por consiguiente, el tamaño total del centro, no influyen en la proactividad del personal investigador ni en la eficacia del centro.

A partir de los resultados globales de nuestros análisis, vemos que la eficacia del centro se explicada por la proactividad de los equipos de I+D+i, seguida por la carga de trabajo de las oficinas de gestión de la investigación, el número de investigadores que hay en el centro, y las prioridades establecidas por los Jefes de las Áreas de I+D. A partir de estos resultados, llegamos a la conclusión de que las prioridades de los Jefes de las Áreas de I+D y la carga de trabajo en las oficinas de gestión de la investigación están significativamente asociadas con la proactividad de los grupos de I+D y con la eficacia del centro. Además, nuestro análisis ha evidenciado que la política de incentivos ofrecidos al personal de las oficinas de gestión de la investigación está significativamente relacionada con la proactividad de los equipos de I+D, independientemente del tamaño de los centros o del número de investigadores que compongan los mismos, el cual se consideró una variable de control en nuestro modelo. Según Kock (2011: 4) "en este caso no importa si los efectos asociados con las variables de control son significativos o no. En los modelos con una variable dependiente principal, es aconsejable colocar la variable de control en el lado derecho del modelo. Esto mejora la legibilidad del modelo".

Asimismo, los resultados obtenidos tienen implicaciones para la gerencia empresarial, pues llegar a conocer cómo implementar medidas para sacar una mayor rendimiento a los programas internacionales de financiación disponibles, de forma que se mejore la adquisición de fondos competitivos en las organizaciones, es un tema clave para cualquier institución que esté y desee avanzar en una economía basada en el conocimiento. Por lo tanto, la aplicación de las herramientas organizativas propuestas puede generar valor añadido a las investigaciones actuales sobre el desempeño de los grupos de I+D, y sobre los actuales servicios que presta el personal de gestión de la investigación en los centros públicos, dada su relevancia, novedad y aplicabilidad. Asimismo, los resultados del estudio pueden tener repercusiones positivas para los responsables de las políticas nacionales de Investigación y Desarrollo Tecnológico, puesto que éstos pueden también ser válidos en países europeos que no estén cumpliendo con las expectativas internacionales fijadas en términos de resultados de sus sistemas nacionales de I+D, y deseen reforzar sus ratios de internacionalización, como es el caso de España (Comisión Europea, 2014, 2014a).

En el capítulo anterior hemos descrito algunos resultados provenientes de modelos de investigación de otras instituciones europeas, que también participaron en el estudio y proporcionaron información útil sobre sus estructuras, estrategia de investigación y diferentes formas de hacer frente a los proyectos de I+D. Estos ejemplos de organizaciones de investigación en otros países han resultado ser tan diferentes entre ellos como de los centros españoles incluidos en la muestra de nuestro estudio. No es sorprendente que la fundación del gran Hospital público de Bruselas presentara problemas e infraestructuras científicas similares a las de algunas de las fundaciones de investigación de los hospitales españoles de nuestra muestra. En cambio, el instituto de investigación de Flandes, altamente especializado, como centro de investigación básica centrado en hacer ciencia excelente al más alto nivel, resultó mucho más exitoso que la fundación de investigación del hospital en obtención de recursos competitivos, siguiendo un patrón de comportamiento similar al de algunos institutos públicos de I+D españoles con modelos de gestión análogos a entidades privadas en cuanto a políticas de empleo y utilización eficiente de los recursos. La organización interna y el enfoque que ofrecen otros centros europeos podría analizarse en estudios futuros, aunque sería necesario incluir más centros públicos internacionales de I+D para completar una muestra representativa, con el objetivo de complementar la visión actual del modelo público español de I+D y avanzar hacia un análisis más amplio y ambicioso.

7.2. LIMITACIONES DEL ESTUDIO

Este estudio tiene algunas limitaciones, pues el análisis empírico se implementó con una muestra de reducido tamaño, compuesta por 68 centros de I+D, en el campo específico de la investigación en Biomedicina y Salud. Esto se debe a la necesidad de concretar al máximo el estudio de investigación, dada la novedad del tema, y la complejidad y diversidad de los datos recogidos.

Durante la planificación del estudio, se mantuvieron varias reuniones y se estableció contacto fluido con el personal responsable de la política de I+D en la Dirección General de Ciencia, Tecnología e Innovación (SGCYT) del Ministerio de Economía, Industria y Competitividad (MINECO), la Oficina Europea de la Fundación Española para la Ciencia y la Tecnología (FECYT) y el Centro para el Desarrollo Tecnológico Industrial (CDTI). Todos ellos manifestaron un gran interés en nuestro estudio, como forma de adquirir nuevo conocimiento y herramientas para la mejora de las políticas públicas de I+D, en relación a la tasa de éxito de las entidades públicas nacionales en cuanto a captación de financiación internacional, estando dispuestos a apoyar activamente el proyecto, con el fin de seguir su desarrollo y aprovechar sus resultados.

Como se ha explicado en capítulos previos, la información de mayor valor a obtener de estas instituciones era conseguir su apoyo, pero sobre todo, que nos proporcionaran información sobre la cantidad de proyectos europeos solicitados y conseguidos por entidad pública española de investigación. En particular, necesitábamos datos objetivos sobre la cantidad de proyectos competitivos internacionales solicitados y conseguidos por los centros públicos incluidos en nuestra muestra. El histórico de proyectos europeos solicitados y concedidos por los centros españoles en los principales programas internacionales estaba disponible pero no estructurado, y se trató con el CDTI incluso una colaboración formal entre nuestras instituciones para ayudar en la extracción y correcta ordenación de esta información. También estábamos interesados en las publicaciones o informes generales que el MINECO pudiera tener sobre los datos de estos centros públicos en términos de proyectos solicitados y obtenidos, a qué programas habían confluido y ganado proyectos, etc. La comprensión de los factores de éxito en la adquisición de fondos competitivos por proyectos internacionales sólo sería posible con un índice de respuesta alto por parte de los centros participantes. Así, el apoyo del Estado, junto con la información objetiva que podían proporcionarnos, era esencial para la legitimidad del estudio y para que los centros percibieran la necesidad de participar en el proyecto. Los principales resultados planteados por el estudio eran los siguientes:

- Ranking de la efectividad de los centros en el logro de proyectos. Si la muestra incluía a toda la población.
- Conocimiento de los factores de éxito en la adquisición de proyectos:
  - Estructura de los equipos de investigación más exitosos.
  - Papel del Director o TMT de los centros en ese éxito: Políticas, prioridades, incentivos, etc.; Percibida por los equipos de I+D y percibida por la dirección; Relación con las características del CEO o Director del centro.
  - Papel de las oficinas de gestión de proyectos: estructura de las oficinas y características de sus miembros; Lista de oficinas con equipos de I+D.

- Benchmarking con otros centros internacionales de I+D. Perfil estratégico (comparativo) entre las organizaciones de I+D.

El MINECO y el ISCIII se beneficiarían de la investigación obteniendo una clasificación de centros de investigación muy útil según su efectividad en la solicitud de proyectos, y criterios formales para evaluar el potencial de los equipos de investigación, políticas o directrices para la mejora de las actuales estructuras de I+D, etc. Para conseguir esto, era crucial obtener una **medida "objetiva"** no proporcionada por los propios centros. La cantidad de proyectos competitivos conseguidos por institución era la **variable dependiente de nuestro estudio** (proactividad y eficacia), y era de gran valor tener acceso a estos datos para conferir total validez y seguridad a los resultados del proyecto. Además, disponer de esta información habría reducido drásticamente los costes de recolección de datos, en términos de tiempo y financiación.

La información sobre nuestras variables dependientes estaba recopilada en la base de datos nacional CORDA, que está gestionada por el CDTI e incluía la participación española en el 7º Programa Marco 2008-2013 de la Comisión Europea (CE). Lamentablemente, obtener el permiso para manejar o consultar esta base de datos no fue posible. El CDTI nos facilitó información sobre proyectos obtenidos por los beneficiarios de nuestra muestra como coordinadores y socios, pero sin la cantidad de proyectos solicitados por entidad beneficiaria, sin diferenciar programas específicos dentro del 7º Programa Marco en el ámbito de las Ciencias de la Salud. A pesar del apoyo y el gran interés en el estudio por parte de los responsables nacionales de la I+D en Ciencia e Innovación, no fue posible darnos acceso a la base de datos CORDA. Así, no se pudo realizar un contraste de las variables dependientes de estudio –proyectos internacionales solicitados y concedidos por cada uno de los centros de la muestra– con las cifras oficiales de la CE que el MINECO tiene recogidas sobre estos resultados. Esta fue una limitación importante para nuestra investigación. Además, todo el proceso para articular herramientas que nos permitieran acceder a la información oficial del CDTI nos llevó más de un año. La recolección de datos del estudio sufrió un retraso de un año y medio, pues no podíamos terminar de diseñar los cuestionarios y comenzar las encuestas hasta que se clarificó el tipo de información y los recursos que estarían disponibles.

Finalmente la información global sobre proyectos competitivos por institución se obtuvo a partir de las encuestas dirigidas a los Responsables de las oficinas de gestión de la investigación. De haber accedido a las cifras oficiales del CDTI sobre solicitud y consecución de proyectos competitivos, podríamos haber tenido una muestra más grande y también información válida de todas las áreas de I+D de los centros participantes en el estudio. De hecho, durante el proceso de recopilación de los datos primarios, no todos los Responsables de las Áreas de I+D de las instituciones contactadas respondieron a los cuestionarios y, por tanto, los datos objetivos de la segunda parte del cuestionario dirigido a los Jefe de Área de I+D o cuestionario "Support", no pudieron ser utilizados en todo su potencial. Dada la falta de información en algunos centros, por la ausencia de respuesta de parte de la totalidad de las diferentes Áreas de I+D, no pudimos comparar los datos objetivos de todas las Áreas de I+D dentro de los mismos centros, y de éstos con el resto de centros participantes.

Otra limitación del estudio se refiere al papel de los Jefes de las Áreas de I+D, pues en ocasiones éstos eran responsables únicamente de una línea de investigación dentro de un área más grande, y respondieron al cuestionario con información sobre su equipo de trabajo, pero no pudieron darnos respuestas válidas para toda el Área de I+D, las cuales a veces contaban con numerosos y diferentes equipos de investigación. Para evitar confusión y como todos ellos eran responsables de al menos uno o varios grupos de I+D, consideramos a todos los encuestados con el mismo nivel de responsabilidad, puesto que no nos era posible recopilar la información de todos los grupos de trabajo incluidos en todas las Áreas de I+D, para cada uno de los centros de la muestra. Por ello, y como se ha mencionado anteriormente, la información total relativa a proyectos competitivos internacionales en todos los centros, se extrajo de la encuesta dirigida al Responsable o Director de la oficina de gestión de la investigación del centro.

Creemos que la información sobre los resultados de las instituciones españolas en relación a la cantidad de proyectos competitivos solicitados y conseguidos de ámbito internacional debería ser pública, tal y como sucede en otros países miembros. No nos parece razonable que estos resultados no estén accesibles para estudios científicos y proyectos universitarios rigurosos como el que nos ocupa. Este tipo de investigaciones son escasas y muy costosas en tiempo y recursos, y las autoridades españolas en materia de I+D+i deberían considerar conveniente y útil proporcionar datos oficiales a académicos, investigadores y entidades públicas como universidades, centros de investigación, etc., interesados en mejorar los resultados y el éxito de nuestras instituciones de investigación, asegurando así la continuidad de investigaciones y tesis doctorales, y el avance en un ámbito de actividad poco explorado.

Se necesitan datos cuantitativos, comparables y fiables para aumentar nuestra comprensión y el seguimiento de los ajustes y las implicaciones sociales y económicas de nuestros resultados. Sin embargo, también se requieren estudios cualitativos adicionales para profundizar nuestro conocimiento sobre el desempeño de las organizaciones de investigación en el ámbito de la I+D internacional, así como para mejorar sustancialmente la comprensión y los objetivos planteados, de forma que se superen las superficialidades y el sesgo que hubiera podido producirse durante el proceso de la recolección de datos.

7.3. FUTURAS LÍNEAS DE INVESTIGACIÓN

Este estudio confía haber iluminado al menos una parte del largo camino que resta hasta comprender completamente el proceso de adquisición exitosa de fondos competitivos por parte de centros públicos de investigación, aunque respecto a investigaciones futuras, hay que reconocer que existen otros factores que también podrían influir en este éxito.

Estudios adicionales en otras temáticas o ámbitos de investigación (Tecnologías de la Información y la Comunicación (TIC), Medio Ambiente, Seguridad, Nuevos Materiales, Nanotecnología, etc.) podrían desarrollarse en el futuro, con el fin de confirmar las aportaciones y resultados obtenidos en el modelo propuesto para el campo de la Biomedicina y Salud. Además, las variables analizadas han supuesto un punto de partida importante para acometer nuevas línea de investigación. Por lo tanto, estas relaciones podrían ampliarse agregando otras preguntas de investigación, más enfocadas en la influencia que las políticas generales en los centros de I+D pueden tener en la proximidad o distancia entre los grupos de trabajo y sus correspondientes interacciones, etc.

La **estructura, las características y la diversidad de los equipos de I+D** de los centros podrían ser factores clave en futuros estudios que tengan por objetivo explorar cómo influyen estas variables en los resultados del equipo al solicitar proyectos competitivos. La experiencia previa de los equipos en proyectos internacionales, su Curriculum Vitae y educación, las alianzas potenciales y las redes de I+D establecidas, la reputación del IP y la eficacia en sus procesos, podrían influir en estos resultados, pues todos estos parámetros podrían aumentar las posibilidades de obtener proyectos colaborativos. De hecho, siguiendo los que Hambrick y Mason (1984), Carpenter et al. (2004) y Hambrick (2007) preconizan, los perfiles demográficos de los individuos y grupos de trabajo dentro de las organizaciones reflejan su cognición, valores y percepciones y, por lo tanto, las opciones estratégicas de la organización y el rendimiento final de sus grupos de trabajo. El estudio de las características demográficas individuales y las características de los equipo de I+D (composición, estructura, diversidad, etc.) podría ser un aspecto crucial para evaluar su eficacia en cuanto al éxito del grupo de trabajo en adquisición de proyectos y el desempeño final del centro en su totalidad.

Siguiendo con la argumentación anterior, algunos factores internos que podrían afectar el resultado de los equipos de I+D dentro de instituciones de investigación están relacionados con las características y la composición de los equipos de trabajo y los departamentos directivos o gerenciales de las organizaciones. Las características de las oficinas de gestión de la investigación, como la formación de su personal, su nivel de estudios y educación, la diversidad del grupo, los procesos de trabajo y las actividades de apoyo que implementan para los grupos de I+D, la interacción con los organismos nacionales e internacionales de financiación y con otros grupos dentro y fuera de la propia institución, su perfiles profesionales más o menos orientados al cliente, etc. Todas estas características observables podrían influir en el desempeño de los equipos de trabajo y también en la eficacia general de los centros. Por lo tanto, algunas características demográficas pueden influir en la eficiencia de los servicios que el personal de gestión de investigación proporciona a los investigadores, y la calidad de estos servicios podría hacer que los investigadores obtengan más recursos de proyectos financiados por convocatorias competitivas. Una futura línea de investigación surgiría en base al estudio de cómo la diversidad de las oficinas de gestión de la investigación puede moderar el éxito de los investigadores en su adquisición de fondos internacionales.

El capítulo tres del estudio se centra en el análisis de los factores internos que puede afectar el resultado de los equipos de I+D dentro de sus instituciones. Además, revisando literatura reciente sobre la eficacia de los grupos de trabajo, el estudio destacó la importancia de implementar procesos eficientes para que las organizaciones tengan buenos resultados, lo que también puede aplicarse a las instituciones de I+D. En particular, el estudio de ha centrado en una variable que podría influir en el resultado de los grupos de investigación, relacionada con el **apoyo que los grupos de I+D reciben de las estructuras gerenciales de su organización,** como el **Director del Centro y/o el Comité de Dirección** (**TMT**). El apoyo que la organización da a los grupos de I+D podría ser estudiado en profundidad, con el fin de averiguar si éste modera de alguna manera el éxito de los centros en la adquisición de fondos competitivos.

Además, y una vez revisada la literatura científica sobre la eficacia de los grupos de trabajo dentro de entidades de investigación, y habiendo desarrollado el análisis sobre los factores internos que influyen en el éxito de estos centros, el estudio de las características demográficas del personal de las oficinas de gestión de la investigación también podría hacerse centrándose en la similitud (o distancia) respecto a las características demográficas de los equipos de I+D. Nuevas investigaciones podrían mostrar cómo estas variables observables y las similitudes existentes entre ambos grupos de trabajo pueden influir en los resultados finales de los investigadores. El estudio de la **proximidad entre las características de los miembros de los equipos de I+D y del personal de gestión de la investigación** en las organizaciones de I+D eficaces –alineación de las características del personal de gestión con las áreas o departamentos de investigación del centro– podría ser de gran utilidad, puesto que esta proximidad podría afectar la eficacia de los grupos de I+D.

Por lo tanto, para evaluar la eficacia de los equipos de las oficinas de gestión y transferencia de tecnología, también sería importante analizar la proximidad que los gestores de investigación y los administradores puedan tener respecto a los proyectos que gestionan. Esto llevaría a estudiar la confluencia que los gestores y administradores de investigación tienen con los ámbito de I+D de sus centros y el conocimiento técnico que los gestores tienen sobre las investigaciones que realizan sus equipos de investigación, lo que puede llegar a crear un sentido de cercanía con los investigadores, influyendo de manera particular en sus relaciones y resultados. De esta forma, otra variable de estudio futuro podría ser el análisis de la conexión entre las oficinas de investigación y los equipos de I+D, en términos de la proximidad que los gestores puedan tener con las áreas de conocimiento con las que interactúan. Ergo, el alineamiento entre los miembros de las oficinas de investigación y los investigadores, y su conocimiento técnico sobre los proyectos de los grupos de I+D. Este tema abre una brecha de investigación importante, pues este conocimiento por parte de los gestores de investigación puede crear un sentimiento de proximidad con los investigadores del centro e influir en la calidad de los trabajos desarrollados y en las relaciones entre estos grupos, mejorando el rendimiento final de los equipos de I+D. De hecho, la proximidad que pudiera derivarse de una mejor comprensión de las oficinas de gestión de I+D sobre los proyectos que supervisan y administran, puede aumentar la calidad de los servicios que se ofrece a los investigadores. Esto también podría influir en la naturaleza de las interacciones que ambos grupos mantienen, en términos de fluidez y calidad, determinando así la importancia, utilidad y apoyo real que los investigadores pueden recibir de sus servicios de gestión de proyectos. El estudio podría ilustrar cómo los grupos de I+D pueden interactuar estrechamente con el personal de gestión de la investigación, con el fin de maximizar sus posibilidades de obtener proyectos competitivos internacionales, es decir, el efecto moderador de **la intensidad de la relación entre los grupos de I+D y el personal de gestión de investigación** sobre la eficacia de los centros.

La diversidad de los grupos de trabajo podría ser otra área de estudio a considerar en el futuro y, en particular, el análisis de las líneas de fallas dentro de los grupos de trabajo, que consideramos de gran interés, pero que no hemos alcanzado a explorar a fondo. Los estudios sobre diversidad de grupos se han centrado en comprender el papel de la conformación de grupos sobre la evaluación del desempeño de los mismos, y la diversidad es cada vez es más aceptada como una característica importante de los equipos en las organizaciones. Se ha demostrado que la diversidad tiene efectos positivos y negativos en el rendimiento de los equipos, y el estudio de la diversidad pretende precisamente entender mejor estos efectos. El **desarrollo de la teoría de las líneas de falla** (Lau y Murnighan, 1998) fue una respuesta a este problema, puesto que propone que la influencia negativa que la diversidad tiene en el equipo se entiende mejor cuando se considera la influencia de diversas dimensiones de la diversidad, en lugar de considerar cómo influye de manera independiente cada dimensión. La teoría de las fallas proporcionó un acercamiento conceptual complementario y más sofisticado al de la diversidad del equipo, pues va más allá de la simple distribución de dimensiones para entender estos resultados. La línea de fallas explica que los miembros del equipo de trabajo difieren simultáneamente en varias dimensiones (género, experiencia, etc.) y los efectos de una dimensión específica pueden ser contingentes a otros, definiéndose como "líneas divisorias hipotéticas que pueden dividir un grupo en subgrupos basándose en uno o más atributos (Lau y Murnighan, 1998; Rico et al. 2012; Thatcher y Patel, 2011; Thatcher y Patel, 2012). Así, los miembros del equipo que comparten características demográficas análogas se alinean creando subgrupos homogéneos dentro de un mismo grupo. Las líneas de fallas compuestas son divisiones concurrentes entre varios patrones de atributos básicos. Los atributos más comunes en la composición de la línea de fallas son el sexo, la raza, la educación, lugar de trabajo, edad y personalidad. Puesto que los equipos de trabajo pueden variar dentro de una amplia gama de dimensiones, las líneas de falla representan la característica más básica de configuración de un equipo. Si la alineación en múltiples dimensiones aumenta la formación de subgrupos, los investigadores de las líneas de fallas sugirieron que éstas serán mejores predictores de procesos y de grupos y del rendimiento de las organizaciones que las variables de la diversidad, las cuales se basan en teorías de dispersión (Bezrukova, Thatcher, Jehn y Spell, 2012).

Siguiendo con este argumento, la líneas de falla constituyen la identificación demográfica de los miembros de un equipo respecto a numerosos atributos dentro de un grupo, y también se ha estudiado el concepto de la fortaleza de la línea de falla o el grado de alineación demográfica entre los miembros dentro de un grupo (Zanutto, Bezrukova y Jehn, 2010). Los procesos y resultados de los equipos están altamente influenciados por estos subgrupos, siendo una línea de investigación importante. Los científicos que estudian las líneas de fallas han aclarado que los subgrupos emergen de las características relacionadas con la composición del equipo (Carton y Cummings, 2012). Las propiedades configuracionales de un grupo o el número de subgrupos que llega a formarse en un equipo y la variación del tamaño de los subgrupos dentro de un mismo equipo, son factores que influyen notablemente en los resultados del equipo.

Van Knippenberg, Dawson, West y Homan (2011) ampliaron el análisis de la categorización social argumentada por la Teoría de fallas con el objetivo de identificar un factor que pudiera disminuir la influencia negativa que éstas producen cuando el equipo de trabajo comparte los mismos objetivos. Los objetivos compartidos pueden hacer que la pertenencia al equipo sea más destacada y los subgrupos aparezcan como menos relevantes, disminuyendo la relación entre las fallas y el desempeño de la entidad, alcanzando un entendimiento más compartido y adaptativo del proceso y los objetivos del equipo (Van Knippenberg et al. 2011).

Partiendo del enfoque de los equipos directivos o del TMT (Hambrick y Mason, 1984), las líneas de fallas son una influencia negativa en el desempeño de la organización en su totalidad (Li y Hambrick, 2005). La literatura científica ha establecido relaciones entre el TMT, las líneas de fallas y los indicadores objetivos acerca del rendimiento en las organizacionales (Van Knippenberg et al. 2011). De hecho, dado que para la Teoría de los *Upper Echelon* el desempeño de la organización es un reflejo de las características del TMT y del rendimiento en el trabajo, tales divisiones pueden tener un impacto negativo en la capacidad global de la entidad para conseguir buenos resultados. Por lo tanto, los grupos de facciones preexisten y, aunque los TMT pueden no ser muy diferentes de otros grupos de trabajo analizados por las investigaciones sobre diversidad, la diversidad del TMT es de particular interés porque puede ser estudiada en relación con el rendimiento de la organización en su conjunto (Carpenter et al. 2004; Hambrick y Mason, 1984), proporcionando relaciones entre las fallas y los indicadores de rendimiento de la organización.

Los métodos empíricos para medir las líneas de falla se han centrado principalmente en dos aspectos: la fuerza de la línea de falla y la distancia de la falla (Thatcher y Patel, 2012). El concepto de la fuerza de las fallas ha sido definido como el nivel de alineación demográfica entre miembros dentro de un grupo (e.g., Lau y Murnighan 1998; Thatcher, Jehn y Zanutto, 2003). La fuerza de una línea de falla aumenta a medida que aumenta la cantidad de atributos sobre los que dos subgrupos se alinean, y establece cuántos atributos demográficos se alinean dentro de un grupo (similitudes) o cuán fácilmente un grupo de trabajo puede dividirse en dos subgrupos homogéneos. Por lo tanto, las líneas de falla varían en intensidad o fuerza en función de la homogeneidad de los subgrupos. Cuando se alinean múltiples atributos de un grupo, las líneas de falla se consideran más fuertes debido a que las diferencias entre subgrupos se hacen más visibles por comparación entre los miembros del equipo. Cuando las categorías llegan a ser significativas y las fallas se activan, las coaliciones pueden dividir un equipo de trabajo. En este caso, los sesgos de los subgrupos hacen que los individuos ayuden y confíen en los miembros de sus subgrupos más que en los subgrupos externos, aumentando las diferencias del grupo, las cuales pueden llegar a interferir en el uso y alcance de la información, bloquear las comunicaciones e impedir que se lleguen a alcanzar acuerdos comunes. Esto también disminuye los beneficios que se derivan de poder utilizar diferentes fuentes de conocimiento relevantes y necesarias para el desempeño de ciertas tareas, lo que también disminuiría el rendimiento y la satisfacción del equipo (Rico et al. 2012).

Si las líneas de las fallas demográficas son una forma de explicar la configuración de los equipos y son claramente importantes para éstos, más incluso que los efectos de la diversidad demográfica, estos resultados deberían prevenir a los investigadores, pues el estudio de las fallas demográficas es relevante para conocer más sobre los equipos de trabajo y su rendimiento, siendo conveniente realizar nuevas investigaciones sobre todas las tipologías de las líneas de fallas. Dado que los equipos son una parte esencial de los entornos organizacionales, cuanto más entendamos sobre su funcionamiento, más podremos guiar a los grupos de trabajo de las organizaciones de forma eficaz (Thatcher y Patel, 2011). Aunque la mayoría de los estudios sobre fallas los hayan realizado investigadores interesados en la diversidad y en los equipos, los estudios futuros sobre fallas podrían ser importantes para investigadores en los campos del empoderamiento, alianzas, subgrupos, redes sociales, comportamiento intergrupal, conflictos, aprendizaje y toma de decisiones (Thatcher y Patel, 2012), en los cuales podría estar incluida la temática de nuestro estudio.

Aunque los temas propuestos en este estudio han analizado la efectividad de los grupos de investigación en la captación de fondos competitivos internacionales para la I+D, la investigación también podría ampliarse y centrarse en otros servicios de apoyo específicos dentro de los centros de I+D, que habitualmente están incluidos dentro de las estructuras de gestión del centro. Un ejemplo de estos nuevos enfoques podría ser analizar el aumento y la mejora de la transferencia de resultados tecnológicos de investigación de los centros públicos de I+D y grupos de investigación de las universidades (impacto de los resultados de I+D+i y de las acciones de innovación en la sociedad); cómo los grupos de I+D obtienen asistencia y apoyo de sus oficinas de transferencia de resultados de investigación en todas las fases del proceso y, por lo tanto, los investigadores podrían llevar al mercado sus desarrollo tecnológicos de forma más eficiente y obtener beneficios económicos. De esta forma, otras investigaciones podrían seguir ampliando nuevos estudios interdisciplinares, de manera que se logre avanzar en la comprensión y las contribuciones realizadas por esta nueva y valiosa temática, maximizando las contribuciones en este ámbito de conocimiento.

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Annexes

A. THE SPANISH 2020 R&D CHALLENGE QUESTIONNAIRE

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The Spanish 2020 R&D Challenge

Este cuestionario forma parte de una investigación apoyada por la Secretaría General de Ciencia, Tecnología e Innovación del Ministerio de Economía y Competitividad. El objetivo de la misma es el de comprender qué factores internos de los centros de I+D influyen en el éxito en la obtención de proyectos internacionales competitivos.

Se pretende conocer mejor los parámetros que ayudan a los centros públicos de I+D españoles del área de biomedicina y salud a mejorar la obtención de financiación internacional para que alcancen mayor competitividad en Europa. Por ello, consideramos que su contribución es imprescindible para el éxito de este proyecto, en tanto que Vd., como Director/Gerente del Centro, puede proporcionar un conocimiento clave sobre los factores que pueden abordarse para mejorar las tasas de éxito de la consecución de financiación internacional.

Somos conscientes de que su tiempo es muy escaso, pero su contribución es de gran importancia para este proyecto. Le informamos que este cuestionario no le llevará más de 10 minutos. Las cuestiones que se plantean se refieren a objetivos y prioridades de la dirección de los últimos 5 años. Si Vd. lleva menos de 1 año EN PUESTOS DE RESPONSABILIDAD DEL CENTRO, indíquenos el nombre de una persona de su equipo directivo con la suficiente experiencia y conocimiento para remitirle el cuestionario.

p1_q1_PRIORIDADES_DE_ACTUACIN_DEL_CENTRO_DE_INVESTIGACIN_EN_LOS_LTIMOS_5_AOS
PRIORIDADES DE ACTUACIÓN DEL CENTRO DE INVESTIGACIÓN EN LOS ÚLTIMOS 5 AÑOS

Priorities
1. PRIORIDADES

1.1. Indique cuáles de las siguientes actuaciones han sido prioritarias (OBJETIVOS CLAVE DE SU CENTRO) en los últimos 5 años con relación a la gestión de la investigación.

Indique en primer lugar cuales de estas acciones son PRIORITARIAS o por el contrario no PRIORITARIAS en su centro.

	1. PRIORITARIA	2. NO PRIORITARIA	3. NO SE REALIZA
1.1.I. I. Incrementar la plantilla de investigadores del centro			
1.1.D. D. Transferencia de tecnología / Spin-offs / cesión de licencias / venta de patentes			
1.1.G. G. Publicaciones divulgativas			
1.1.C. C. Convenios con otras entidades y organismos de I+D			
1.1.E. E. Conseguir financiación general por otras vías			
1.1.F. F. Publicaciones científicas			
1.1.B. B. Obtención de financiación vía proyectos internacionales			
1.1.L. L. Organización de actividades científicas (p.e. congresos, workshops, jornadas...)			
1.1.H. H. Obtención de patentes			
1.1.J. J. Tesis doctorales			
1.1.K. K. Convenios con empresas /entidades privadas (p.e. Ensayos clínicos, contratos de servicios...)			
1.1.A. A. Obtención de financiación vía proyectos competitivos nacionales/regionales			

M. Otras actividades prioritarias que considere relevantes (especificar)

Max_priori
1.2. Máxima prioridad

Indique ahora cuál de ellas HA SIDO LA MÁS PRIORITARIA durante los últimos 5 años:

Min_prior
1.3. Menor prioridad

De entre las destacadas como NO PRIORITARIAS, indique ahora la que considera que HA SIDO MENOS PRIORITARIA de todas en los últimos 5 años. (No tome en consideración las señaladas como NO SE REALIZA).

PCONT_orig_fondos
2. ACCIONES RELACIONADAS CON EL PERSONAL INVESTIGADOR

2.1. Con respecto a la POLÍTICA DE CONTRATACIÓN DE PERSONAL INVESTIGADOR de su centro en los ÚLTIMOS CINCO AÑOS.

Indique en qué grado han sido importantes las siguientes vías de obtención de fondos para la contratación de personal investigador en los últimos 5 años.

	(0) No se realiza	(1) Muy bajo	(2) Bajo	(3) Medio	(4) Alto	(5) Muy alto
PC_FINCONVOCAT Adjudicación de fondos públicos vía convocatoria competitiva para la contratación de personal investigador						
PC_FINPROYS Adjudicación de fondos públicos para la contratación de personal investigador a través de fondos de proyectos de investigación competitivos						
PC_FINCONVENIO Adjudicación de fondos derivados de convenios con instituciones o empresas para la contratación de personal investigador						
PC_FINPROPIA Adjudicación de fondos propios de la institución para la contratación de personal investigador						

PCONT_Perfil_desead
2.2. Perfil de personal investigador deseado

Indique en qué grado se han considerado los PERFILES INVESTIGADORES expresados a continuación en los procesos de búsqueda y contratación realizados por su centro en los últimos años.

	(0) No se ha considerado	(1) Se ha considerado muy poco	(2) Se ha considerado poco	(3) Se ha considerado normalmente	(4) Se ha considerado mucho	(5) Se ha considerado crucial
PERFIL_EXCEL Buscar y contratar investigadores de muy alto nivel (atracción de excelencia)						
PERFIL_EXPER Buscar y contratar investigadores experimentados (atracción de talento)						
PERFIL_NOVEL Buscar y contratar investigadores noveles prometedores (formación de talento)						

PCONT_medios
2.3. Acciones de promoción de los puestos de trabajo ofertados por el centro

Indique en qué grado se han utilizado los siguientes métodos de difusión para las ofertas de empleo que realiza su centro.

	(0) No se realiza	(1) Muy Bajo	(2) Bajo	(3) Medio	(4) Alto	(5) Muy alto
PC_WEB Publicación en la página web del centro/institución						
PC_CONTACTOS Difusión y envío de la oferta a otros centros y redes con los que se mantiene contacto						
PC_OFICIAL Publicación oficial en los boletines y medios oficiales (p.e. BOE o equivalentes)						

p2_q1_POLITICAS_ORIENTADAS_A_LA_CONSECUCIN_DE_FINANCIACIN_DE_LA_INVESTIGACIN_A_TRAVS_DE_CONVOCATORIAS_COMPETITIVAS_INTERNACIONALES

POLITICAS ORIENTADAS A LA CONSECUCIÓN DE FINANCIACIÓN DE LA INVESTIGACIÓN A TRAVÉS DE CONVOCATORIAS COMPETITIVAS INTERNACIONALES

3

3. INCENTIVOS A INVESTIGADORES POR CONSECUCIÓN DE PROYECTOS

3.1. Con relación a la OBTENCIÓN DE PROYECTOS DE INVESTIGACIÓN INTERNACIONALES

Indique en qué grado se dan en su organización los siguientes efectos.

LA OBTENCIÓN DE PROYECTOS COMPETITIVOS INTERNACIONALES POR PARTE DE GRUPOS DE INVESTIGACIÓN DEL CENTRO...

	1 No se produce	2	3	4	5 Se produce siempre
3.1.1.E ...repercute positivamente en el salario de los investigadores del grupo que obtiene el proyecto					
3.1.2.E ...repercute positivamente en el salario de TODOS los investigadores y personal del centro, aunque no formen parte del grupo que lo obtiene					
3.1.3.E ...proporciona al grupo solicitante del proyecto mayor seguridad para mantener sus puestos de trabajo					
3.1.4.E ...incrementa las posibilidades de lograr ascensos o promociones laborales para los miembros del equipo solicitante					
3.1.5.E ...mejora la valoración y el respeto que reciben los miembros del equipo solicitante por parte del resto del personal del centro					
3.1.6.E ...eleva el reconocimiento de los miembros del grupo por parte de sus superiores					
3.1.7.I ...proporciona mayor libertad a los miembros del equipo solicitante en términos de flexibilidad horaria, autonomía, menor supervisión, etc.					
3.1.8.I ...posibilita a los miembros del equipo solicitante la consecución de objetivos que, para ellos, merecen la pena					
3.1.9.I ...abre oportunidades para que los miembros del equipo solicitante aprendan cosas o técnicas nuevas					
3.1.10.I ...permite a los miembros del equipo de investigación solicitante desarrollar cosas que les hacen sentirse bien consigo mismos					
3.1.11.I ...ofrece a los miembros del equipo buenas oportunidades para desarrollar habilidades y destrezas					

p2_q3_4_TOMA_DE_DECISIONES_SOBRE_PRESENTACIN_DE_SOLICITUDES_A_CONVOCATORIAS_COMPETITIVAS_INTERNACIONALES

4. TOMA DE DECISIONES SOBRE PRESENTACIÓN DE SOLICITUDES A CONVOCATORIAS COMPETITIVAS INTERNACIONALES

DM_struct

4.1. Indique cuáles de los siguientes grupos o unidades existen en su centro

- [ ] Unidad estratégica o departamento de proyectos internacionales, creado específicamente para impulsar la participación en programas internacionales (UEPI)
- [ ] Directoria de programas internacionales, responsable de la dinamización y mejora de la participación del centro en convocatorias competitivas internacionales (DPI)
- [ ] Unidad u oficina de gestión de proyectos del centro (información, presentación, justificación) (OGPI)
- [ ] Unidad u oficina de transferencia de tecnología o resultados de la investigación (OTRI)
- [ ] Unidad integrada para gestión de proyectos y la transferencia de tecnología (OTRIPI)
- [ ] Áreas de Investigación con un responsable claramente definido (AR)

p2_q5_42_Indique_el_grado_de_influencia_que_tienen_los_grupos_o_unidades_existentes_en_su_organizacin_con_respecto_a_las_decisiones_relativas_a_la_presentacin_de_solicitudes_a_convocatorias_competitivas_internacionales

4.2. Indique el grado de influencia que tienen los grupos o unidades existentes en su organización con respecto a las decisiones relativas a la presentación de solicitudes a convocatorias competitivas internacionales

El grado de influencia se refiere a la capacidad de definir a qué convocatorias presentar solicitudes y a la definición de las mismas (p.e. partners, objetivos, etc.)

	1 Nada/No existe	2 Poca influencia	3 Influencia moderada	4 Mucha influencia	5 Influencia absoluta
UEPI_inf Unidad o departamento de proyectos internacionales (UEPI)					
DPI_inf Directoria de programas internacionales (DPI)					
OGPI_inf Oficina de gestión de proyectos internacionales (OGPI)					
OTRI_inf Oficina o Unidad de Transferencia de Resultados de Investigación (OTRI)					
OTRIPI_inf Unidad integrada de gestión de proyectos internacionales y transferencia de resultados de investigación (OTRIPI)					
AR_inf Jefes de Área de Investigación (AR)					
TMT_inf Órganos de Dirección del Centro					
CEO_inf Director General del Centro					
IP_inf Investigadores Principales					

p2_q6_5_DATOS_DE_CLASIFICACIN_DE_LA_DIRECCIN_DEL_CENTRO

5. DATOS DE CLASIFICACIÓN DE LA DIRECCIÓN DEL CENTRO

CEO_gender

Indique a continuación los siguientes datos relativos al perfil del director del centro

Sexo:

CEO_edad

Edad:

CEO_nivel_est

Nivel de estudios:

Si su nivel de estudios es otro, por favór idique cuál:

CEO_tipo_estudios
A continuación indique la rama de la titulación posee (p.e. medicina; farmacia; biotecnología...):

CEO_tenure_puesto
Año de inicio en su puesto actual:

CEO_Tenure_org
¿Ocupó otros puestos directivos anteriormente dentro del centro?

- Sí
- No

CEO_div_intrapers_funcional
En caso afirmativo, indique sus puestos anteriores y el número de años en los que ocupó dichos cargos:

	Puesto	Número de años

CEO_exp_previa_sector
¿Ha trabajado cómo directivo en otros CENTROS DE INVESTIGACIÓN de ámbito biomédico?

- Sí
- No

CEO_exp_previa_otros
¿Ha trabajado en puestos directivos en OTROS CENTROS DE ÁMBITO NO BIOMÉDICO?

- Sí
- No

CEO_diver_exp_previa
En caso de respuesta afirmativa a las dos preguntas anteriores indique los centros en los que ha ocupado cargos directivos, el número de años en los que trabajó, y el país del centro (si este no fue España):

	Nombre del centro	Número de años	Nombre del país, si es diferente a España
Centro 1			
Centro 2			
Centro 3			
Centro 4			
Centro 5			

B. RESEARCH MANAGEMENT OFFICE QUESTIONNAIRE

Spanish 2020 challenge - Research office

En este cuestionario se pretende medir factores que influyen en el éxito en la obtención de proyectos internacionales competitivos en centros públicos de I+D españoles, desde el punto de vista del papel que desempeñan las oficinas de gestión de proyectos y transferencia de tecnología como apoyo a los grupos de I+D en dicho proceso. Somos conscientes de que su tiempo es limitado y valioso, pero consideramos que su contribución es imprescindible para el éxito de este proyecto en tanto que usted, como Responsable de la Oficina de Gestión de la Investigación/Transferencia de Tecnología de su Centro, puede proporcionar conocimiento sobre los aspectos que los equipos directivos pueden abordar para mejorar los resultados en sus organizaciones. Este cuestionario le llevará un máximo de 20 minutos. Las cuestiones que se plantean se refieren a características y resultados del centro en los últimos 5 años. Si Ud. lleva menos de 1 año como Directivo de la Oficina de Gestión de Proyectos o Tranferencia de Tecnología. indíquenos el nombre de la persona de su equipo con el suficiente conocimiento del tema para remitirle el cuestionario. Le agradecemos de antemano su colaboración.

p1_q1_PARTE_1_DESCRIPCIN_DE_ACTIVIDAD_DE_LA_OFICINA_DE_GESTIN_DE_LA_IDI_DEL_CENTRO

PARTE 1. DESCRIPCIÓN DE ACTIVIDAD DE LA OFICINA DE GESTIÓN DE LA I+D+i DEL CENTRO

Como responsable de la Oficina de Gestión de la I+D+i de su centro, responda a continuación a las siguientes preguntas relativas al tipo de trabajo desempeñado por la oficina

Activity_OGI

1.1 Tipos de actividades gestionadas por la oficina.

Rellene los datos requeridos señalando el intervalo correcto para cada actividad desarrollada durante la pasada anualidad:

Indique para cada tipo de actividad el número de acciones gestionadas durante EL ÚLTIMO AÑO

	Ninguno	De 1 a 5	De 6 a 10	De 11 a 20	De 21 a 35	Más de 35
Proyectos_gestionados Proyectos competitivos internacionales gestionados						
Proyectos_solicitados Solicitudes de proyectos competitivos internacionales tramitadas						
Patentes_gestionadas Transferencia de tecnología: Número de patentes gestionadas						
Contratos_Int_gestionados Contratos de I+D Internacionales gestionados						
Contratos_rrhh_gestionados Contratos gestionados de incorporación de personal con cargo a fondos internacionales competitivos						
Spin_off Formación de empresas derivadas de las investigaciones realizadas en el centro (Spin-Off)						

Proyect_INTER_SOLIC

1.2 Proyectos internacionales SOLICITADOS en los últimos 5 años

Rellene los datos requeridos señalando el intervalo correcto para cada actividad desarrollada durante los últimos 5 años:

	Ninguno	De 1 a 20	De 21 a 40	De 41 a 60	De 61 a 100	Más de 100
Proyectos_SOLIC_CENTRO Número de proyectos internacionales SOLICITADOS por el centro						

Proyect_INTER_SOLIC_COORD

1.3 Proyectos internacionales SOLICITADOS COMO COORDINADORES en los últimos 5 años

Rellene los datos requeridos señalando el intervalo correcto para cada actividad desarrollada durante los últimos 5 años:

	Ninguno	De 1 a 10	De 11 a 24	De 25 a 35	De 36 a 50	Más de 50
Proyectos_SOLIC_COORD_CENTRO Número de proyectos internacionales SOLICITADOS como COORDINADORES por el centro						

Proyect_INTER_SOLIC_COORD2

1.4 Proyectos internacionales CONCEDIDOS en los últimos 5 años

Rellene los datos requeridos señalando el intervalo correcto para cada actividad desarrollada durante los últimos 5 años:

	Ninguno	De 1 a 10	De 11 a 20	De 21 a 35	Más de 36
Proyectos_CONCED_CENTRO Número de proyectos internacionales CONCEDIDOS al centro					

Proyect_INTER_SOLIC_COORD1

1.5 Proyectos internacionales CONCEDIDOS COMO COORDINADORES en los últimos 5 años

Rellene los datos requeridos señalando el intervalo correcto para cada actividad desarrollada durante los últimos 5 años:

	Ninguno	De 1 a 7	De 8 a 15	De 16 a 25	Más de 26
Proyectos_CONCED_COORD_CENTRO Número de proyectos internacionales CONCEDIDOS como COORDINADORES por el centro					

Proyect_INTER_SOLIC_COORD3

1.6 Indique sobre la siguiente escala el intervalo que mejor describe la actividad desarrollada por el área de investigación que Ud. dirige en relación a la financiación solicitada de proyectos internacionales, en los últimos 5 años

Rellene los datos requeridos señalando el intervalo correcto para cada actividad desarrollada durante los últimos 5 años:

	0 €	De 1 a 500.999€	De 501.000 a 3 millones €	De 3.000.001 a 7 millones de €	De 7.000001 a 15 millones €	De 15.000.001 a 25 millones €	Más de 25 millones €
Financ_SOLIC_PROYINT Financiación total SOLICITADA en proyectos competitivos internacionales							
Financ_SOLIC_COORD_PROYINT Financiación total SOLICITADA como COORDINADORES por proyectos internacionales							

Proyect_INTER_SOLIC_COORD4

1.7 Indique sobre la siguiente escala el intervalo que mejor describe la actividad desarrollada por el área de investigación que Ud. dirige en relación a la financiación conseguida de proyectos internacionales, en los últimos 5 años

Rellene los datos requeridos señalando el intervalo correcto para cada actividad desarrollada durante los últimos 5 años:

	0 €	De 1 a 500.999€	De 501.000 a 1 millón €	De 1.000.001 a 4 millones €	De 4.000.001 a 8 millones de €	De 8.000001 a 12 millones €	Más de 12 millones €
Financ_CONSEG_PROYINT Financiación total CONSEGUIDA en proyectos competitivos internacionales							
Financ_CONSEG_COORD_PROYINT Financiación total CONSEGUIDA COMO COORDINADORES por proyectos internacionales							

Proyec_SOLIC_PROGRAM_INTERN

1.8 En relación a los proyectos de investigación que ha solicitado el centro en los últimos 5 años y atendiendo a los programas internacionales, indique cuáles de ellos ha solicitado y la cantidad

	Nunca solicitado	Solicitud de 1 a 5	Solicitud de 6 a 10	Solicitud de 11 a 19	Solicitud de 20 o más
7pm_COOP_HEALT Séptimo Programa Marco-Cooperación HEALTH					
7pm_COOP_BIO Séptimo Programa Marco-Cooperación BIO					
7pm_COOP_TIC Séptimo Programa Marco-Cooperación TIC					
7PM_COOP_ENVIR Séptimo Programa Marco-Cooperación ENVIRONMENT					
7pm_COOP_NANOT Séptimo Programa Marco-Cooperación NANOTECHNOLOGIES					
7pm_IDEAS-ERC Séptimo Programa Marco_IDEAS (ERC)					
7pm_MCA Séptimo Programa Marco-Marie Curie Actions					
7pm_INFRAE Séptimo Programa Marco-Infraestructures					
7pm_GRANDI Séptimo Programa Marco_Grandes iniciativas					
Dgenvir_PROGR_LIFE DG ENVIRONMENT-Programa LIFE+					
Dgsanc_PROGR_SALUD DG SANCO-Programa de Salud					
Dgjustic_PROGR_DPHNE DG JUSTICE-Programa DAPHNE					
Fondos_FEDER FONDOS FEDER (European Social & Cohesion					
Program_CIP Programa CIP (Innovación y competitividad					
nih_EEUU NIH-EEUU					

Otros programas solicitados: (indique el nombre del programa y el número de solicitudes)

Proyec_SOLIC_PROGRAM_INTERN1

1.9 En relación a los proyectos de investigación internacionales que ha conseguido el centro en los últimos 5 años, indique cuales ha conseguido y la cantidad

	Nunca conseguido	Conseguido de 1 a 3	Conseguido de 4 a 6	Conseguido de 7 a 10	Coseguido más de 10
7pm_COOP_HEALT Séptimo Programa Marco-Cooperación HEALTH					
7pm_COOP_BIO Séptimo Programa Marco-Cooperación BIO					
7pm_COOP_TIC Séptimo Programa Marco-Cooperación TIC					
7PM_COOP_ENVIR Séptimo Programa Marco-Cooperación ENVIRONMENT					
7pm_COOP_NANOT Séptimo Programa Marco-Cooperación NANOTECHNOLOGIES					
7pm_IDEAS-ERC Séptimo Programa Marco_IDEAS (ERC)					
7pm_MCA Séptimo Programa Marco-Marie Curie Actions					
7pm_INFRAE Séptimo Programa Marco-Infraestructures					
7pm_GRANDI Séptimo Programa Marco_Grandes iniciativas					
Dgenvir_PROGR_LIFE DG ENVIRONMENT-Programa LIFE+					
Dgsanc_PROGR_SALUD DG SANCO-Programa de Salud					
Dgjustic_PROGR_DPHNE DG JUSTICE-Programa DAPHNE					
Fondos_FEDER FONDOS FEDER (European Social & Cohesion					

Program_CIP Programa CIP (Innovación y competitividad					
nih_EEUU NIH-EEUU					

Otros programas conseguidos: (indique el nombre del programa y el número de solicitudes)

Investigación

1.10 Indique que tipo de acciones se realizan por parte de la oficina de gestión de la I+D+i con relación al apoyo a los grupos de investigación para la solicitud de proyectos de investigación competitivos de ámbito internacional.

Indique en qué grado se desempeñan las siguientes actividades por parte de la oficina de gestión de la I+D+i del centro

	No se realiza	Sólo se realiza bajo petición	Existe un protocolo o procedimiento estándar para todos los grupos	Existe un protocolo o procedimiento de información personalizada para cada grupo
Difus_conv Difusión a los investigadores del centro de información sobre convocatorias internacionales				
Docum_con Facilitación a los investigadores de la documentación asociada a cada convocatoria				
Gest_solicit Gestión de las solicitudes				
Seguimiento Seguimiento de resoluciones provisionales de concesión, alegaciones, y resoluciones definitivas de concesión				
Justificac Justificación económica				
Presupuesto Preparación de presupuestos para la realización de solicitudes				
Memoria Colaboración en la elaboración de la memoria científico - técnica				
Formacion Organización de jornadas y cursos formativos a investigadores sobre preparación de proyectos				
valoracion_previa Comunicación e interacción con grupos de investigadores del centro para valorar la solicitud de nuevos proyectos competitivos				
Gestion_rrhh Gestión de los Recursos Humanos asignados al proyecto				

p1_q12_Emply_title

Asimismo, con relación al apoyo a los investigadores para SOLICITAR proyectos de investigación competitivos de ámbito internacional, indique si la oficina dispone de las siguientes características

	Sí	No
Gestores_espec La oficina tiene claramente identificados gestores/asesores especializados para cada programa de financiación competitiva		
Gestores_grupo La oficina tiene claramente identificados gestores/asesores en cada uno de los grupos de investigación		
Resp_OGI_TMT El Responsable de la Oficina de Gestión de la I+D+i forma parte del equipo de coordinación de la Investigación del Centro		
Resp_OGI_decision El Responsable de la Oficina de Gestion puede participar en la decisión de a qué convocatorias presentar proyectos internacionales		

p2_q1_PARTE_2_POLITICAS_DEL_CENTRO_ORIENTADAS_A_LA_CONSECUCIN_DE_FINANCIACIN_DE_LA_INVESTIGACIN_A_TRAVS_DE_CONVOCATORIAS_COMPETITIVAS_INTERNACIONALES

PARTE 2. POLITICAS DEL CENTRO ORIENTADAS A LA CONSECUCIÓN DE FINANCIACIÓN DE LA INVESTIGACIÓN A TRAVÉS DE CONVOCATORIAS COMPETITIVAS INTERNACIONALES

INCEN_MIEMB-OFIC

2.1 INCENTIVOS PARA LOS MIEMBROS DE LA OFICINA DE GESTIÓN DE LA I+D+i POR CONSECUCIÓN DE PROYECTOS

Con relación a la OBTENCIÓN DE PROYECTOS DE INVESTIGACIÓN INTERNACIONALES...

Indique en qué grado se dan en su organización los siguientes efectos

LA OBTENCIÓN DE PROYECTOS INTERNACIONALES POR PARTE DE GRUPOS DE INVESTIGACIÓN DEL CENTRO...

	1 No se produce	2	3	4	5 Se produce siempre
2.1.1.E ...repercute positivamente en el salario de los MIEMBROS de la oficina de gestión de la I+D+i del centro					
2.1.2.E ...repercute positivamente en el salario de TODOS los investigadores y personal del centro, aunque no formen parte del grupo que lo obtiene					
2.1.3.E ...proporciona MAYOR SEGURIDAD para mantener sus puestos de trabajo a los miembros de la oficina de gestión de la I+D+i del centro					
2.1.4.E ...incrementa las posibilidades de los miembros de la oficina de gestión de la I+D+i de lograr ASCENSOS O PROMOCIONES laborales					
2.1.5.E ...mejora la VALORACIÓN y el RESPETO que reciben los miembros de la oficina de gestión de la I+D+i del centro por parte del resto del personal					
2.1.6.E ...eleva el RECONOCIMIENTO de los miembros de la oficina de gestión de la I+D+i del centro por parte de sus superiores					
2.1.7.I ...proporciona MAYOR LIBERTAD a los miembros de la oficina de gestión de la I+D+i en términos de flexibilidad horaria, autonomía, menor supervisión, etc.					
2.1.8.I ...posibilita a los miembros de la oficina de gestión de la I+D+i la CONSECUCIÓN DE OBJETIVOS que, para ellos, merecen la pena					
2.1.9.I ...ABRE OPORTUNIDADES para que los miembros de la oficina de gestión de la I+D+i aprendan cosas nuevas					
2.1.10.I ...permite a los miembros de la oficina de gestión de la I+D+i desarrollar cosas que les hacen SENTIRSE BIEN consigo mismos					
2.1.11.I. ...ofrece a los miembros de la oficina de gestión de la I+D+i buenas oportunidades para desarrollar HABILIDADES Y DESTREZAS					

p3_q1_PARTE_3_CARACTERIZACIN_DEMOGRFICA_DE_LA_OFICINA_DE_GESTIN_DE_LA_Idi_DEL_CENTRO

PARTE 3. CARACTERIZACIÓN DEMOGRÁFICA DE LA OFICINA DE GESTIÓN DE LA I+d+i DEL CENTRO

DEMO_charac_OGI

3.1 Por favor, indique de forma numérica cuántos miembros de la Oficina de Gestión de la I+D+i cumplen cada una de las características indicadas (considere gestores nacionales e internacionales)

Si no dispone de la información exacta puede indicar datos aproximados

	Indique el número
Número total de miembros que forman parte de la oficina de gestión de la investigación	
Sobre el total ¿cuántas personas ocupan funciones de gestor de proyectos?	
Sobre el total, ¿cuántas son mujeres?	
¿Cuántos de ellos habían trabajado antes en puestos similares en otros centros de I+D+i?	
¿Cuántos de ellos han trabajado o trabajan también como investigadores además de sus funciones en gestión?	
¿Cuántos de ellos tienen un buen dominio del inglés?	
¿Cuántos de ellos son funcionarios o tienen contratos indefinidos?	
¿Cuántos de ellos son doctores o están realizando un doctorado?	
¿Cuántos de ellos son de otras nacionalidades diferentes a la Española?	
¿Cuántos de ellos son miembros de asociaciones de gestores de la investigación (p.e. ARMA, REGIC...)	

Miembros

3.2 Por favor, indique de forma numérica cuántos miembros hay en la Oficina de Gestión de la I+D+i que se incorporaron a la oficina o a su puesto actual

	Menos de 2 años	Entre 2 y 4 años	Entre 4 y 6 años	Más de 6 años
Indique cuántas personas se han incorporado a la oficina de gestión de la I+D+i del centro en cada uno de los siguientes intervalos				

Miemrbos

3.3 Por favor, indique de forma numérica cuántos miembros de la Oficina de Gestión de la I+D+i poseen las siguientes titulaciones

Indique en cada caso el número de personas de la oficina que disponen de estudios en estas áreas

	Número de personas
Economía/A.D.E o similares	
Otras ciencias sociales (derecho, relaciones laborales, ciencias del trabajo...)	
Ingenierías	
Ciencias básicas (química, física, matemáticas...)	
Ciencias de la Salud (farmacia, veterinaria, medicina, biología...)	
Formación de ámbito universitario (grados o postgrados) relacionadas específicamente con la gestión de proyectos o la gestión de la investigación	
Formación (cursos de al menos 8 horas) sobre gestión de proyectos internacionales de I+D	

Miemrbos

3.4 Por favor, indique de forma numérica cuántos miembros de la Oficina de Gestión de la I+D+i poseen los siguientes grados académicos

Indique en cada caso el número de personas de la oficina que disponen de estudios del grado indicado

	Número de personas
Doctores	
Licenciados/Graduados	
Diplomados	
Ciclos formativos de grado medio, bachiller y similares	

Miembros

3.5 Por favor, indique de forma numérica cuántos miembros de la Oficina de Gestión de la I+D+i se encuentran en los siguientes intervalos de edad

	Número de personas
<30 años	
30	
40	
50	
>60 años	

p4_q1_PARTE_4_DATOS_DE_CLASIFICACIN_DE_LA_PERSONA_RESPONSABLE_DE_LA_OFICINA_DE_GESTIN_DE_LA_INVESTIGACIN_DEL_CENTRO

PARTE 4. DATOS DE CLASIFICACIÓN DE LA PERSONA RESPONSABLE DE LA OFICINA DE GESTIÓN DE LA INVESTIGACIÓN DEL CENTRO

CEO_OGI_titulación

4.1 Por favor, rellene los datos requeridos sobre las características del puesto del Responsable de la Oficina de Gestión de la investigación del Centro

Titulación académica que posee el/la actual director/a

CEO_OGI_GradoAc

Nivel académico del(de la) actual responsable

CEO_OGI_age

Edad del(de la) actual responsable

CEO_OGI_gender

Sexo de(de la) actual responsable de la Oficina de Gestión de la Investigación

CEO_OGI_TenureORG

Año en que se incorporó como trabajador(a) en este centro

CEO_OGI_TenureJOB

Año en que accedió a esta posición en la organización

CEO_OGI_JobType

Tipo de relación laboral del responsable de la oficina

Responsable

Grado de dominio de idiomas del(de la) actual responsable de la oficina de gestión de la investigación

	Bajo	Medio	Alto
ENG Inglés			
FRE Francés			

Otros idiomas con alto dominio (especificar)

C. RESEARCH AREA DIRECTOR QUESTIONNAIRE

013JA6 The Spanish 2020 Challenge - Research Areas Directors

Este cuestionario forma parte de una investigación apoyada por la Secretaría General de Ciencia, Tecnología e Innovación del Ministerio de Economía y Competitividad. El fin del proyecto es obtener unos parámetros que ayuden a los centro públicos de I+D españoles a mejorar la obtención de financiación internacional, para que alcancen mayor competitividad en Europa.
Se pretende obtener información sobre cómo influye la naturaleza de los equipos de investigación en la obtención de fondos internacionales y la ventaja competitiva que supone conseguirlos, así como la relación que éstos tienen con las estructuras de gestión, con otros equipos de I+D del centro, y con otros grupos de I+D externos. Por ello, consideramos que su contribución es imprescindible para el éxito de este Proyecto, en tanto que Vd., como Director o Responsable de Área de Investigación, puede proporcionar conocimiento sobre aquellas variables que pueden modificarse por el equipo directivo de los centros para mejorar los resultados de sus organizaciones.
Este cuestionario le llevará un máximo de 20 minutos. Las cuestiones que se plantean se refieren a características y resultados de su AREA de investigación en los últimos años. Si Vd. lleva menos de 1 año como Jefe de Área de Investigación, indíquenos el nombre de la persona de su equipo directivo con mayor experiencia para remitirle el cuestionario. Muchas gracias.

p1_q1_PARTE_1_TIPO_DE_ACTIVIDADES_QUE_SE_REALIZAN_DENTRO_DEL_REA_DE_INVESTIGACIN_EN_RELACION_A_LA_ADQUISICIN_DE_FINANCIACIN_COMPETITIVA_INTERNACIONAL_PROACTIVIDAD

PARTE 1. TIPO DE ACTIVIDADES QUE SE REALIZAN DENTRO DEL ÁREA DE INVESTIGACIÓN EN RELACION A LA ADQUISICIÓN DE FINANCIACIÓN COMPETITIVA INTERNACIONAL (PROACTIVIDAD)

Con el fin de valorar el tipo de actividades que realiza su grupo de investigación, a continuación se plantean una serie de preguntas sobre la modalidad de los trabajos de investigación realizados dentro de su ÁREA.

Inv_BAS_APLIC

1.1 Indique cómo es la investigación que se realiza en su ÁREA, teniendo en cuenta tanto la investigación básica como la investigación aplicada

	100% básica	80% bás/ 20% aplic	60% bás / 40% aplic	50% / 50%	40% bás / 60% aplic	20% bás / 80% aplic	100% aplicada	
Investigación Básica	○	○	○	○	○	○	○	Investigación Aplicada

Inv_ESPEC_MULTID

1.2 Indique cómo es la investigación por equipos de I+D que realiza su ÁREA , teniendo en cuenta si está especializada en un área o es de carácter multidisciplinar (que aplica varias áreas de conocimiento a su investigación)

	100% especializ	80% espec/ 20% mult	60% espec/ 40% mult	50% / 50%	20% espec / 80% mult	40% espec / 60%mult	100% multidisc	
Investigación Especializada	○	○	○	○	○	○	○	Investigación Multidisciplinar

Inv_COOLAB_SCOLAB

1.3 Indique cómo es la investigación por equipos de I+D que realiza su ÁREA , teniendo en cuenta las colaboraciones con equipos de investigación DE SU CENTRO

	100% con colaboración	80% con colaboración/ 20% sin colaboración	60% con colaboración/ 40% sin colaboración	50% con colaboración/ 50% sin colaboración	40% con colaboración/ 60% sin colaboración	20% con colaboración/ 80% sin colaboración	100% sin colaboración	
Investigación con colaboración	○	○	○	○	○	○	○	Investigación sin colaboración

Inv_GRUPN_GRUPI

1.4 Indique cómo es la investigación realizada por los investigadores de su ÁREA , teniendo en cuenta las colaboraciones con GRUPOS DE OTROS CENTROS, tanto nacionales como internacionales

	100% nacional	80% nacional/ 20% internacional	60% nacional / 40% internacional	50% nacional / 50% internacional	40% nacional / 60% internacional	20% nacional / 80% internacional	100% internacional	
Investigación con grupos nacionales (de otros centros)	○	○	○	○	○	○	○	Investigación con grupos internacionales (de otros centros)

Inv_EMPRES_PRIVD

1.5 Indique cómo es la investigación realizada por los investigadores de su ÁREA, atendiendo a si esta se realiza en colaboración con empresas u organizaciones públicas o privadas (no de I+D)

	100% con empresas ´públicas o privadas	80% con empresas públicas o privadas	50% con empresas públicas o privadas	60% con empresas públicas o privadas	40% con empresas públicas o privadas	20% con empresas públicas o privadas	0% con empresas públicas o privadas
Investigación realizada	○	○	○	○	○	○	○

Capt_SOLIC_PROYT

1.6 Atendiendo a las vias de búsqueda y selección de socios para la solicitud de proyectos internacionales, indique con qué frecuencia lleva a cabo cada una de las siguientes acciones

Las acciones se refieren al establecimiento de contactos para la captación de socios con el objetivo de la solicitud de proyectos internacionales

Indique su respuesta según la frecuencia de interacción con los mismos siendo 1 "nunca" y 7 "siempre"

	1 Nunca	2 Casi nunca	3 Pocas veces	4 Algunas veces	5 Muchas veces	6 Casi siempre	7 Siempre
Cont_GI+D_CR Contacto con grupos de I+D conocidos regionales							
Cont_GI+D_CN Contacto con grupos de I+D conocidos nacionales							
Cont_GI+D_CI Contacto con grupos de I+D conocidos internacionales							
Cont_WI_BS Contacto a través de webs internacionales de búsqueda de socios							
Cont_EVC Contacto a través de eventos científicos (congresos, workshops, etc.)							
Cont_EMPC Contacto a través de empresas conocidas							

Partic_PRESENT_PROYT

1.7 En relación a la participación de su ÁREA en las convocatorias de presentación de proyectos internacionales, indique con qué frecuencia se lleva a cabo la siguiente acción

Indique su respuesta siendo 1 "nunca" y 7 "siempre"

	1 Nunca	2 Casi nunca	3 Algunas veces	4 Pocas veces	5 Muchas veces	6 Casi siempre	7 Siempre
Part_RA_DC_PI El Responsable del ÁREA participa en la decisión de a qué convocatorias presentar proyectos internacionales							

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p3_q1_PARTE_2_RELACIN_DEL_PERSONAL_INVESTIGADOR_DEL_REA_CON_OTROS_GRUPOS_DE_TRABAJO_PARA_LA_SOLICITUD_Y_CONCESIN_DE_PROYECTOS_DE_INVESTIGACIN_INTERNACIONALES

PARTE 2. RELACIÓN DEL PERSONAL INVESTIGADOR DEL ÁREA CON OTROS GRUPOS DE TRABAJO PARA LA SOLICITUD Y CONCESIÓN DE PROYECTOS DE INVESTIGACIÓN INTERNACIONALES

Con el fin de valorar la relación que mantienen los investigadores de su ÁREA entre ellos y con otros grupos de trabajo, a continuación se plantean una serie de preguntas sobre este tipo de relaciones, en el proceso de solicitud y consecución de proyectos internacionales.

INT_GRUP

2.1 Indique con qué frecuencia lleva a cabo cada una de las siguientes acciones cuando se plantea la solicitud de un proyecto de investigación internacional

Las acciones se refieren al establecimiento de contactos con grupos de trabajo con los que interactúa para valorar su conveniencia o para perfilar la propuesta.

Indique su respuesta según la frecuencia de interacción con los mismos siendo 1 "nunca" y 7 "siempre"

	1 Nunca se realiza	2 Casi nunca se realiza	3 Pocas veces se realiza	4 Algunas veces se realiza	5 Muchas veces se realiza	6 Casi siempre se realiza	7 Siempre se realiza
Cont_INV_AREA Contacto con investigadores de mi ÁREA de investigación							
Cont_INV_OAREA_PC Contacto con investigadores de otras ÁREAS (de mi propio centro)							
Cont_INV_OCN Contacto con investigadores de otros centros de I+D nacionales							
Cont_INV_OCI Contacto con investigadores de otros centros de I+D internacionales							
Cont_PER_OGIC Contacto con personal de la oficina de gestión de la investigación de mi centro							
Cont_PER_EPPN Contacto con personal de las estructuras de promoción de proyectos a nivel nacional (puntos nacionales de contacto, etc.)							
Cont_PER_EPPI Contacto con personal de las estructuras de promoción de proyectos a nivel internacional (si los hubiere, p.e. evaluadores de la CE, miembros de comisiones de valoración, etc.)							

CONFI_INV_AREA

2.2 Responda a las siguientes preguntas respecto a su relación con los investigadores de su propia ÁREA en el marco de las solicitudes de proyectos de investigación

Cuando me planteo la solicitud de un proyecto de investigación internacional…

	1 Nunca	2	3	4	5	6	7 Siempre
Deped_INV_AREA Me siento bien cuando dependo de investigadores de mi ÁREA para llevar a cabo las tareas de solicitud de proyectos de investigación							
PCont_MIE_EQUIP Creo que puedo contar con los miembros de mi ÁREA de investigación si necesito ayuda en la selección de convocatorias y en la elaboración de las solicitudes							
Conf_MIE_EQUIP Confío plenamente en los miembros de mi ÁREA para encargarse autónomamente de tareas de solicitud de proyectos							
Conf_CAP_INV-AREA Confío en la capacidad de los investigadores de mi ÁREA para desempeñar con éxito todas las tareas de los proyectos que solicitan							

CONFE_INV_OAREA

2.3 Valore los siguientes aspectos sobre su relación con investigadores de otras ÁREAS de investigación o investigadores de otros centros, cuando se plantea colaboraciones para solicitar proyectos de investigación internacionales

Cuando me planteo una colaboración para solicitar proyectos internacionales con equipos de otras ÁREAS de investigación o de otros centros…

	1 Nunca	2	3	4	5	6	7 Siempre
Deped_INV_OAREA Me siento bien cuando dependo de investigadores de otras ÁREAS o de otros centros para llevar a cabo las tareas y procesos de solicitud de proyectos de investigación							
PCont_INV_OEQUIP Creo que puedo contar con los investigadores de los otros equipos si necesito ayuda en la selección de convocatorias y en la elaboración de las solicitudes							
Conf_INV_OEQUIP Confío plenamente en los investigadores de los otros equipos para encargarse autónomamente de tareas de solicitud de proyectos							
Conf_INV-OAREA Creo que puedo compartir información relevante para preparar solicitudes de proyectos con investigadores de otras ÁREAS o centros de I+D sin temer que se aprovechen de mi o de mis trabajos, incluso aunque les surgieran oportunidades para hacerlo							
Comp_INV_OEQUIP Creo que los investigadores de otros equipos con los que colaboramos para solicitar proyectos mantendrán siempre los compromisos que adquieran nosotros							

CONF_PER_OGPC

2.4 Valore la relación mantenida con el personal de la Oficina de Gestión de Proyectos de su centro cuando se solicitan proyectos de investigación internacionales

Cuando solicito un proyecto de investigación internacional…

	1 Nunca						7 Siempre
Deped_PER_OGPC Me siento seguro al dejar en manos del personal de la Oficina de Gestión de Proyectos la tramitación y gestión de mis solicitudes de proyectos internacionales							
Conf_GEST_ADEC En mi centro, puedo contar con los gestores de I+D adecuados si necesito su ayuda en la solicitud y gestión de proyectos internacionales							
Conf_GEST_PROF Confío plenamente en la profesionalidad de los gestores/administradores de la I+D de mi centro para el desarrollo de solicitudes y gestión de proyectos internacionales							
Comp_PERS_GEST Creo que puedo compartir información relevante para preparar solicitudes y gestión de proyectos internacionales con el personal de gestión sin temer que se aprovechen de mi o de mis trabajos, incluso aunque les surgieran oportunidades para hacerlo							
Comp_GINV Creo que los gestores de investigación mantendrán siempre los compromisos que adquieran conmigo en la gestión de proyectos internacionales							

p5_q1_PARTE_3_RELACIN_CON_LA_DIRECCIN_EN_LA_SOLICITUD_DE_PROYECTOS_Y_PRIORIDADES_DE_INVESTIGACIN_DEL_REA

PARTE 3. RELACIÓN CON LA DIRECCIÓN EN LA SOLICITUD DE PROYECTOS Y PRIORIDADES DE INVESTIGACIÓN DEL ÁREA

En este apartado se valora el apoyo que su ÁREA de investigación (o el ÁREA de investigación que Ud. dirige) recibe de la Dirección de su Centro en los procesos de solicitud y consecución de proyectos de investigación internacionales, así como las prioridades de su ÁREA de investigación

APOY_SOLIC_PROY_INTERN

3.1 ¿Siente Ud. que el director del centro, o los órganos gerenciales del mismo, apoyan a su ÁREA de investigación a la hora de solicitar proyectos de investigación internacionales?

Valore su opinión utilizando la siguiente escala: 1 "ningún apoyo" y 5 "apoyo total"

1 Ningún apoyo	2	3	4	5 Apoyo Total

RAZ_ESTABL_AREA

3.2 Atendiendo a las principales razones que provocaron el establecimiento de su ÁREA de investigación en el centro, indique su grado de acuerdo con las siguientes afirmaciones

Utilice la escala siguiente: 1 "totalmente en desacuerdo" y 5 "totalmente de acuerdo"

Las principales razones para establecer mi ÁREA de investigación en el centro fueron.....................

	1 Totalmente en desacuerdo	2	3	4	5 Totalmente de acuerdo
Iniciat_INDV_CL Por iniciativa de uno o unos pocos individuos clave					
Aumen_CONOC_AMBS Por la necesidad de aumentar el conocimiento en este ámbito del saber					
Cruz_TRABINT_OAREAS Por necesidad de cruzar trabajo interdisciplinar con otras ÁREAS					
Crear_PROG_ACDINV Para crear un nuevo programa académico/ investigador					
Decis_POLIT Por decisión política, no del propio personal académico- investigador					

DIF_ APOY_AREA

3.3 Considerando el historial del ÁREA, señale si está de acuerdo o no con las siguientes afirmaciones sobre las dificultades encontradas y los apoyos recibidos

Utilice la escala siguiente: 1 "totalmente en desacuerdo" y 5 "totalmente de acuerdo"

	1 Totalmente en desacuerdo	2	3	4	5 Totalmente de acuerdo
Apoy_DIRCT-CENTRO El apoyo del Director del centro ha sido crucial para el desarrollo del ÁREA					
Apoy_OAREAS Otras áreas de investigación han apoyado el desarrollo de nuestra ÁREA					
Apoy_ORGAN_POLITIC El ÁREA no habría prosperado sin el apoyo de organismos políticos					
Escep_OAREAS Hemos encontrado gran escepticismo por parte de las otras ÁREAS del centro					
Ginvest_PCONTACT Hay grupos de investigación en el centro que a penas mantienen contacto entre ellos					
Dific_SOC_ESPAÑ Ha sido difícil encontrar socios españoles o de nuestra región para proyectos internacionales					
Problem_MIEMB_OC Nuestro centro ha tenido problemas serios con miembros de otros centros o de otras entidades					

RETOS_AREA

3.4 En la actualidad, y atendiendo a los principales retos en su área de investigación, indique su grado de prioridad con las siguientes afirmaciones

Utilice la escala siguiente: 1 "nada prioritario" y 5 "prioridad absoluta"

	1 Nada prioritario	2	3	4	5 Prioridad absoluta
Conseg_FINANC_PROYEC Conseguir más financiación a largo plazo ligada a proyectos					
Obten_FINANC_NLPROYNI Obtener más financiación de base no ligada a proyectos nacionales o internacionales					
Increm_PUBLICI Incrementar el número de publicaciones internacionales					
Atrai_BUENINV Atraer a buenos investigadores					
Mejor_COLABI Mejorar las colaboraciones internacionales					
Desar_PROGRC Desarrollar un programa científico mejor					
Cons_APOY_DIREC Conseguir más apoyo de la Dirección del centro					
Mejor_LIDERZ_CAREA Mejorar el liderazgo científico del ÁREA					
Consg_APOY_ENTDP Conseguir mejores apoyos de los entes decisores políticos					
Mejr_OPORT_EMPLI Mejorar las oportunidades de empleo para los investigadores					
Aum_COLABI Aumentar las colaboraciones con la industria					
Desar_PROGF Desarrollar programas formativos					
Cons_RDOS_RDOS_APLC Conseguir resultados aplicables y prácticos a partir de los proyectos de investigación realizados					
Cons_APOY_OAREAS Conseguir mayor apoyo de otras ÁREAS de I+D					
Mejor_CULTI_AREA Mejorar la cultura investigadora del ÁREA y del centro					
Aum_APOY_OAREAS Aumentar el apoyo recibido de otras ÁREAS de I+D locales o regionales					
Hfren_PROBLI_COLAB Hacer frente a problemas internos de comunicación /colaboración					

p6_q1_PARTE_4_POLTICAS_DE_INCENTIVACIN_PARA_EL_PERSONAL_INVESTIGADOR_EN_LA_OBTENCIN_DE_PROYECTOS_INTERNACIONALES

PARTE 4. POLÍTICAS DE INCENTIVACIÓN PARA EL PERSONAL INVESTIGADOR EN LA OBTENCIÓN DE PROYECTOS INTERNACIONALES

Con el fin de valorar los incentivos que tienen los investigadores de su ÁREA de investigación (o del ÁREA de investigación que Ud. dirige) , a continuación se plantean una serie de preguntas sobre los incentivos ofrecidos por el centro durante el pasado año, así como la importancia que éstos tienen para potenciar la consecución de proyectos competitivos internaciones.

INCENT_INVEST_CENTRO

4.1 En relación a los tipos de incentivos ofrecidos por su centro a los investigadores de su área durante el año pasado, indique su respuesta para cada opción con un Si o un No

	1 SI	2 NO
Ppieal_INV_AREA Los investigadores del ÁREA tienen un presupuesto anual fijo, con independencia de que consigan o no proyectos competitivos		
Ppto_AREAID_VARIB Mi centro asigna un mayor PRESUPUESTO A MI ÁREA en función de los proyectos internacionales que conseguimos (no considerar el dinero de los proyectos)		
Incent_NOMONETAR Mi centro proporciona beneficios no monetarios a las ÁREAS/ investigadores que consiguen más proyectos internacionales (viajes a congresos, cursos, estancias breves, etc. no pagados con fondos del proyecto)		
Dotac_FONDOS Mi centro dota fondos internos para contratar personal investigador en las ÁREAS que consiguen más proyectos competitivos internacionales (personal no pagado directamente con fondos del proyecto)		

Otro tipo de incentivos o apoyos de la Dirección del centro asociados a la consecución de proyectos competitivos (Indíquelos)

RAZ_ESTAB_AINV1

4.2 Con relación a la OBTENCIÓN DE PROYECTOS DE INVESTIGACIÓN INTERNACIONALES, Indique en qué grado se dan en su organización los siguientes efectos.

Utilice la escala siguiente: 1 "no se produce" y 5 "se produce siempre"

LA OBTENCIÓN DE PROYECTOS COMPETITIVOS INTERNACIONALES POR PARTE DE GRUPOS DE INVESTIGACIÓN DEL CENTRO...

	1 No se produce	2	3	4	5 Se produce siempre
Sal_INVEST ...repercute positivamente en el salario de los investigadores del grupo que obtiene el proyecto					
Posib_PROMOC ... mejora las posibilidades de promoción de los investigadores del grupo					
Oport_DESARR_SB ... proporciona la oportunidad de poder desarrollar el trabajo que les hace sentirse bien					
Segur_MANT_PT ...proporciona al grupo solicitante del proyecto mayor seguridad para puestos de trabajo					
Oport_DESAR_HYD ... permite al equipo la oportunidad para desarrollar sus habilidades y destrezas					
LIBERT_PI ...proporciona mayor libertad a los miembros del equipo solicitante en términos de flexibilidad horaria, autonomía, menor supervisión, etc.					
Posib_LOGRAR_SOCIED ...posibilita a los miembros del equipo solicitante la consecución de objetivos que, para ellos, merecen la pena					
Respt_PI_COLEG ... mejora el prestigio que recibe el personal investigador de sus colegas					
Recono_PI_SUPER ... mejora el reconocimiento que recibe el personal investigador de sus superiores					
AMIST_INVEST ... mejora la amistad que mantienen los investigadores con las personas con la que trabajan (gestores, otros investigadores, etc.)					

p7_q1_PARTE_5_DATOS_DE_CLASIFICACIN_DEL_RESPONSABLE_O_JEFE_DEL_REA_DE_LA_INVESTIGACIN

PARTE 5. DATOS DE CLASIFICACIÓN DEL RESPONSABLE O JEFE DEL ÁREA DE LA INVESTIGACIÓN

Indique a continuación los siguientes datos relativos al perfil del Responsable o Jefe del ÁREA

Años_RESP_AREA

5.1 Indique el número de años que lleva como responsable/jefe de ÁREA

- Menos de 5 años
- Entre 5 y 10 años
- Más de 10 años

Años_PUEST_ANTER

5.2 Indique el número de años que ha estado en puestos anteriores similares

- Menos de 5 años
- Entre 5 y 10 años
- Más de 10 años

Centr_DIRECC_CENTRO1

5.3 ¿Participa en las decisiones sobre la estrategia científica del centro?

- Si
- No

Género_RESP_AREA1

5.4 Sexo:

Edad_RESP_AREA1

5.5 Edad:

NivelEstudios_RESP_AREA1

5.6 Nivel de estudios:

Si su nivel de estudios es otro, por favor indique cuál

NivelEstudios_RESP_AREA

5.7 A continuación indique la rama de titulación que posee (p.e. medicina, farmacia, biotecnología,...):

D. RESEARCH SUPPORT AREA DIRECTOR QUESTIONNAIRE

013AJA6 The Spanish 2020 Challenge - Research Support Areas Directors

Este cuestionario forma parte de una investigación apoyada por la Secretaría General de Ciencia, Tecnología e Innovación del Ministerio de Economía y Competitividad. El fin del proyecto es obtener unos parámetros que ayuden a los centro públicos de I+D españoles a mejorar la obtención de financiación internacional, para que alcancen mayor competitividad en Europa.
Se pretende obtener información sobre cómo influye la naturaleza de los equipos de investigación en la obtención de fondos internacionales y la ventaja competitiva que supone conseguirlos, así como la relación que éstos tienen con las estructuras de gestión, con otros equipos de I+D del centro, y con otros grupos de I+D externos. Por ello, consideramos que su contribución es imprescindible para el éxito de este Proyecto, en tanto que Vd., como Director o Responsable de Área de Investigación, puede proporcionar conocimiento sobre aquellas variables que pueden modificarse por el equipo directivo de los centros para mejorar los resultados de sus organizaciones.
Este cuestionario le llevará un máximo de 20 minutos. Las cuestiones que se plantean se refieren a características y resultados de su AREA de investigación en los últimos años. Si Vd. lleva menos de 1 año como Jefe de Área de Investigación, indíquenos el nombre de la persona de su equipo directivo con mayor experiencia para remitirle el cuestionario. Muchas gracias.

p1_q1_PARTE_1_DESCRIPCIN_DE_LA_ACTIVIDAD_DEL_REA_DE_INVESTIGACIN_QUE_UD_DIRIGE

PARTE 1. DESCRIPCIÓN DE LA ACTIVIDAD DEL ÁREA DE INVESTIGACIÓN QUE UD. DIRIGE

El objetivo de esta parte es conocer el tipo y el volumen de trabajo que se desarrolla en su ÁREA de investigación. A continuación se plantean una serie de preguntas sobre las actividades que han realizado en los últimos 5 años.

ACT_INV_proy1

1.1 Indique sobre la siguiente escala el intervalo que mejor describe la actividad desarrollada por el ÁREA de investigación que Ud. dirige en los últimos 5 años

	Ninguno	De 1 a 5	De 6 a 10	De 11 a 20	Más de 20
Sol_NRP Número de proyectos de investigación SOLICITADOS en los últimos 5 años en convocatorias competitivas de ámbito NACIONAL	○	○	○	○	○
Sol_IRP Número de proyectos de investigación SOLICITADOS en los últimos 5 años en convocatorias competitivas de ámbito INTERNACIONAL	○	○	○	○	○
Con_NRP Número de proyectos de investigación CONCEDIDOS que han obtenido de convocatorias competitivas NACIONALES en los últimos 5 años	○	○	○	○	○
Con_IRP Número de proyectos de investigación CONCEDICOS en convocatorias competitivas INTERNACIONALES que han logrado en los últimos 5 años	○	○	○	○	○
Tesisl_INVG Número de tesis doctorales LEÍDAS por investigadores del ÁREA	○	○	○	○	○
Tesisd_INV_AREA Número de tesis doctorales DIRIGIDAS por los investigadores del ÁREA	○	○	○	○	○

ACT_INV_proy2

1.2 Indique sobre la siguiente escala el intervalo que mejor describe la actividad desarrollada por el ÁREA de investigación que Ud. dirige COMO COORDINADORES, en los últimos 5 años

	Ninguno	De 1 a 3	De 4 a 6	De 7 a 9	Más de 9
Sol_PRYI_SC Número de proyectos de investigación internacionales SOLICITADOS como coordinadores en los últimos 5 años	○	○	○	○	○
Con_PRI_CC Número de proyectos de investigación internacionales CONCEDIDOS como coordinadores en los últimos 5 años	○	○	○	○	○

ACT_INV_proy

1.3 Indique sobre la siguiente escala el intervalo que mejor describe la actividad desarrollada por el ÁREA de investigación que Ud. dirige, en los últimos 5 años

	De 0 a 50.999€	De 51.000 a 100.999€	De 101.000 a 350.999€	De 351.000 a 500.999€	De 501.000 a 1 millón €	Más de 1 millón €
FinanSol_PROY_CI Financiación total SOLICITADA por el ÁREA SIN SER COORDINADOR en proyectos competitivos internacionales						
FinanSol_COORD_PI Financiación total SOLICITADA por el ÁREA como COORDINADORES por proyectos competitivos internacionales						
FinanCons_PROY_CI Financiación total CONSEGUIDA por el ÁREA SIN SER COORDINADOR por proyectos competitivos internacionales						
FinanCons_COORD_PI Financiación total CONSEGUIDA por el ÁREA como COORDINADORES por proyectos internacionales						

Funding_Efficacy

1.4 En el caso de que haya disfrutado de proyectos de investigación nacionales o internacionales de carácter competitivo, responda a las siguientes preguntas

Si no ha tenido proyectos de investigación, pase a la pregunta 1.7

	Indique el valor aproximado
¿Qué volumen de financiación aproximado han supuesto los proyectos competitivos NACIONALES y REGIONALES en los últimos 5 años? Indique el volumen aproximado en EUROS	
¿Qué porcentaje suponía esta financiación sobre el total solicitado en convocatorias competitivas NACIONALES y REGIONALES ? Indique un porcentaje de 0 a 100	

Proyec_SOLIC_PROGRAM_INTERN

1.5 En relación a los proyectos de investigación que ha solicitado su ÁREA en los últimos 5 años y atendiendo a los programas internacionales, indique cuáles de ellos ha solicitado

- Séptimo Programa Marco-Cooperación HEALTH
- Séptimo Programa Marco-Cooperación BIO
- Séptimo Programa Marco-Cooperación TIC
- Séptimo Programa Marco-Cooperación ENVIRONMENT
- Séptimo Programa Marco-Cooperación NANOTECHNOLOGIES
- Séptimo Programa Marco_IDEAS (ERC)
- Séptimo Programa Marco-Marie Curie Actions
- Séptimo Programa Marco-Infraestructures
- Séptimo Programa Marco_Grandes iniciativas (AAL. IMI, KBBE, etc)
- DG ENVIRONMENT-Programa LIFE+
- DG SANCO-Programa de Salud
- DG JUSTICE-Programa DAPHNE
- FONDOS FEDER (European Social & Cohesion Funds)
- Programa CIP (Innovación y competitividad empresarial)
- NIH-EEUU
-

Otros programas solicitados (indíque el nombre)

Proyect_CONCED_PROGRAM_INTERN

1.6 En relación a los proyectos de investigación que ha conseguido su ÁREA los últimos 5 años y atendiendo a los programas internacionales, indique cuáles de ellos ha conseguido

- [ ] Séptimo Programa Marco-Cooperación HEALTH
- [ ] Séptimo Programa Marco-Cooperación BIO
- [ ] Séptimo Programa Marco-Cooperación TIC
- [ ] Séptimo Programa Marco-Cooperación ENVIRONMENT
- [ ] Séptimo Programa Marco-Cooperación NANOTECHNOLOGIES
- [ ] Séptimo Programa Marco_IDEAS (ERC)
- [ ] Séptimo Programa Marco-Marie Curie Actions
- [ ] Séptimo Programa Marco-Infraestructures
- [ ] Séptimo Programa Marco_Grandes iniciativas (AAL. IMI, KBBE, etc)
- [ ] DG ENVIRONMENT-Programa LIFE+
- [ ] DG SANCO-Programa de Salud
- [ ] DG JUSTICE-Programa DAPHNE
- [ ] FONDOS FEDER (European Social & Cohesion Funds)
- [ ] Programa CIP (Innovación y competitividad empresarial)
- [ ] NIH-EEUU
- [ ] Otros programas conseguidos (indíquelos)

ACT_INV2_contr

1.7 Indique sobre la siguiente escala el intervalo que mejor describe la actividad desarrollada por el ÁREA de investigación que Ud. dirige en los últimos 5 años

Con relación al establecimiento de contratos o convenios con empresas e instituciones públicas o privadas

	Ninguno	De 1 a 15	De 16 a 30	De 31 a 45	De 46 a 60	Más de 60
Convenios_Intern Número de convenios/contratos INTERNACIONALES suscritos con instituciones privadas o públicas, mediante convocatorias no competitivas en los últimos 5 años	○	○	○	○	○	○
convenios_nac Número de convenios/contratos NACIONALES suscritos con instituciones privadas o públicas en los últimos 5 años	○	○	○	○	○	○

ACT_INV3

Respecto a patentes y creación de empresas innovadoras

	Ninguno	De 1 a 3	De 4 a 7	De 8 a 11	12 o más
Patentes Número de patentes presentadas	○	○	○	○	○
Patentes_colab ... de éstas, núm. de patentes presentadas EN COLABORACIÓN con otros centros de I+D	○	○	○	○	○
spin_off Número de empresas spin-off creadas por miembros del área de investigación	○	○	○	○	○

PUB

1.8 Indique el número total de publicaciones en JCR de los miembros de su ÁREA de investigación durante los últimos 5 años, señalando la cantidad aproximada de publicaciones dentro de cada año indicado

Si no lo recuerda exactamente, indique el valor aproximado

	2009	2010	2011	2012	2013
Total publicaciones del ÁREA					
Publicaciones en primer cuartil indexados					

p2_q1_PARTE_2_DATOS_DE_CLASIFICACIN_DE_LOS_MIEMBROS_DEL_REA

PARTE 2. DATOS DE CLASIFICACIÓN DE LOS MIEMBROS DEL ÁREA

Indique a continuación los siguientes datos relativos al perfil de los miembros del ÁREA

Miemb_AREA

2.1 Indique el número total de los miembros que componen el ÁREA (sólo personal investigador)

Grup_I+D_AREA

2.2 Indique el número total de grupos de I+D que existen dentro de su ÁREA

Miemb_AREA_SEXO

2.3 Indique el número total de mujeres y de hombres que hay entre los miembros de su ÁREA

1. Hombres
2. Mujeres

Titul_MIEMB_AREA

2.4 Indique el número total de miembros de su ÁREA según la titulación de los mismos

1.Medicina

2.Biología

3.Química/ Bioquímica

4.Farmacia

5.Economía

6.Estadística

7.Enfermería

8.Matemáticas

9.Biotecnología

10.Veterinaria

11.Ingeniería

12.Ciencias Ambientales

13.Psicología

14.Sociología

15.Otros (especificar)

Gradoa_MIEMB_AREA

2.5 Indique el número total de miembros de su ÁREA según el grado académico de los mismos

1.Doctores

2.Doctorandos

3.Licenciados y graduados (no doctorandos)

4.Diplomados

5.Ciclos formativos de grado medio, bachiller y similares

Categp_MIEMB_AREA

2.6 Indique el número total de miembros de su ÁREA según la categoría profesional de los mismos

1.Investigadores Senior

2.Investigadores Posdoc

3.Investigadores Predoc

4.Técnicos: de laboratorio, de soporte a la investigación, DUE

5.Auxiliares (personal de administración)

6.Auxiliares de soporte a la investigación

7.Becarios

8.Personal en formación

RelacLab_MIEMB_AREA

2.7 Indique el número total de miembros de su ÁREA según la relación laboral de los mismos

1.Funcionarios/ estatutarios

2.Contratados indefinidos

3.Contratados eventuales

DedicacLab_MIEMB_AREA

2.8 Indique el número total de miembros de su ÁREA según la dedicación laboral de los mismos

1.A tiempo completo

2.A tiempo parcial

Estud_MIEMB_CAUTON

2.9 Indique el número total de miembros de su ÁREA según la comunidad autónoma española dónde hayan cursado los estudios de la titulación que poseen. En el caso de los miembros que estudiaron en el extranjero indique el país y la ciudad

1. Comunidad de Madrid

2. Cataluña

3. La misma comunidad de ubicación de su centro

4. Otras comunidades españolas

5. Extranjero (indíque el número total con País y Ciudad)

Exp_EXTRANJ_MIEM_AREA

2.10 Atendiendo a la experiencia en el extranjero de los miembros de su ÁREA, responda a las siguientes cuestiones

1.Núm. total de investigadores que han realizado estancias en el extranjero superior 6 meses

2.De éstos, Núm. total de investigadores que han realizado sus estancias en los últimos 5 años

Esp_LABOR_MIEM_AREA

2.11 Atendiendo a la experiencia laboral de los miembros de su ÁREA responda a las siguientes cuestiones

1.Núm. total de investigadores que han estado contratados en otros centros de I+D+i NACIONALES en los últimos 5 años

2.Núm. total de investigadores que han estado contratados en otros centros de I+D+i INTERNACIONALES en los últimos 5 años

Domin_IDIOM_MIEM_AREA

2.12 Atendiendo al dominio de idiomas de los miembros de su ÁREA responda a las siguientes cuestiones

1.Núm. total de investigadores que dominan el inglés

2.Núm. total de investigadores que dominan otro idioma comunitario

Edad_MIEM_AREA

2.13 Indique el número total de miembros de su ÁREA según la edad de los mismos

1. menos de 30 años
2. entre 30 y 40 años (ambos inclusive)
3. entre 41 y 50 años (ambos inclusive)
4. entre 51 y 60 años (ambos inclusive)
5. más de 60 años

Fecha_INCORPCEN_MIEM_AREA

2.14 Indique el número total de miembros de su ÁREA según su antigüedad en el centro

1. menos de 2 años
2. entre 2 y 4 años (ambos inclusive)
3. entre 5 y 7 años (ambos inclusive)
4. entre 8 y 10 años (ambos inclusive)
5. más de 10 años

Fecha_PTOACT_MIEM_AREA

2.15 Indique el número total de miembros de su ÁREA según la antigüedad que tienen en su puesto actual de trabajo

1. menos de 2 años
2. entre 2 y 4 años (ambos inclusive)
3. entre 5 y 7 años (ambos inclusive)
4. entre 8 y 10 años (ambos inclusive)
5. más de 10 años

Expr_GESTPROY_MIEM_AREA

2.16 Atendiendo a la experiencia en la gestión de proyectos de los miembros de su ÁREA responda a las siguientes cuestiones

1.Núm. total de investigadores que han trabajado como gestores (formalmente) en otros centros europeos

2.Núm. investigadores que forman parte de alguna asociación sobre gestión internacional de la I+D

E. SUPPORT LETTER FROM THE ISCIII-MINECO DIRECTOR

MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

Instituto de Salud Carlos III

Madrid, 5 de marzo de 2014

Objeto: Colaboración en Estudio sobre los factores mejoran las tasas de éxito en la obtención de financiación competitiva internacional para proyectos de investigación

El Instituto de Salud Carlos III (ISCIII) está al tanto del proyecto de investigación que se refiere a continuación y cuyo objetivo es explicar qué factores mejoran las tasas de éxito en la obtención de financiación competitiva internacional para proyectos de investigación por parte de centros y entidades públicas de I+D+i españoles.

Este estudio es de gran interés para el ISCIII porque su muestra se centra específicamente en el área de Salud, por tanto, sus conclusiones serán de aplicación directa en nuestro campo, y de gran valor para la mejora de la capacidad de obtención de financiación de proyectos de investigación internacionales.

La investigación está siendo desarrollada por un equipo de investigadores de la Universidad de Valencia, y cuenta con la colaboración del ISCIII y de la Secretaría General de Ciencia, Tecnología e Innovación del Ministerio de Economía y Competitividad.

El elemento diferencial de esta investigación consiste en que se aborda desde la perspectiva de dirección y administración de organizaciones, y su contribución tiene gran potencial en tanto que proporcionará conocimiento sobre factores que pueden ser moderados o gestionados por la dirección/administración de los centros, con el fin de mejorar el acceso a financiación competitiva internacional.

Para que esta investigación sea un éxito y es de crucial importancia la colaboración e implicación de todos los centros de I+D incluidos en la muestra. El estudio requiere de la obtención de datos de tres fuentes diferentes de cada centro: (1) los responsables del centro; (2) los líderes de las áreas de investigación; (3) y los responsables de las estructuras de apoyo a la gestión de proyectos internacionales.

Desde el ISCIII, le solicitamos su colaboración con este estudio para que los actores implicados de su organización respondan los cuestionarios que han sido elaborados. Le adelantemos, no obstante, que cada persona entrevistada deberá dedicar un máximo de 15 minutos de su tiempo. En el anexo a esta carta encontrará el tipo de información que se solicita a cada uno de los grupos relevantes y las instrucciones para la cumplimentación de los cuestionarios. La confidencialidad de la información proporcionada está absolutamente garantizada y los datos serán utilizados sólo y exclusivamente con fines estadísticos y tratados de modo agregado. Con este fin, el equipo de investigación ha elaborado un compromiso de confidencialidad depositado ante notario y ante la comisión de ética de la Universidad de Valencia.

En los próximos días, los responsables de la ejecución del estudio se pondrán en contacto con Ud. para ampliar esta información y concretar cómo será el proceso de recogida de datos en su centro.

Agradeciendo de antemano su participación e implicación, reciba un cordial saludo.

MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD · INSTITUTO DE SALUD CARLOS III · DIRECCIÓN

Antonio Andreu
Director Instituto de Salud Carlos III

Datos de contacto del proyecto: alejandro.escriba@uv.es 963838880

F. SUPPORT LETTER FROM THE GENERAL SECRETARY OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH AND INNOVATION OF MINECO

MINISTERIO
DE ECONOMIA Y
COMPETITIVIDAD

María Luisa Poncela García

SECRETARIA GENERAL DE CIENCIA, TECNOLOGÍA E INNOVACION

Madrid, 10 de diciembre de 2014

Asunto: Colaboración en estudio sobre los factores relacionados con el éxito en convocatorias competitivas europeas e internacionales.

La Universidad de Valencia está desarrollando un proyecto cuyo objetivo es identificar los factores organizativos relacionados con las tasas de éxito de los centros y entidades públicas de I+D+i españoles en convocatorias competitivas europeas e internacionales. Este estudio está focalizado en el ámbito de la biomedicina y se centra en componentes relacionados con la organización de los centros.

Esta Secretaría General tiene un gran interés en esta iniciativa porque sus resultados permitirán establecer manuales de buenas prácticas o modelos de gestión para incrementar la competitividad internacional de los centros españoles.

Para que este estudio tenga éxito es necesaria la colaboración de tres tipos de agentes de los centros incluidos en la muestra: (1) los responsables del centro; (2) los responsables de las áreas de investigación, y (3) los responsables de las estructuras de apoyo a la gestión de los proyectos europeos e internacionales.

Próximamente, los responsables de la ejecución del estudio se pondrán en contacto con usted para solicitarle que los agentes de su centro respondan a unos cuestionarios. En el anexo a esta carta encontrará el tipo de información que se solicita y las instrucciones para cumplimentar los cuestionarios. La dedicación de cada persona entrevistada no supondrá más de 15 minutos.

La confidencialidad de la información proporcionada está absolutamente garantizada. Los datos serán utilizados de forma agregada y exclusivamente con fines estadísticos. El equipo responsable del proyecto ha depositado ante notario un compromiso de confidencialidad, que ha sido recogido también por el Comité de Ética de la Universidad de Valencia.

Le agradezco de antemano su participación e implicación.

Reciba un cordial saludo,

MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD
SECRETARÍA GENERAL DE CIENCIA, TECNOLOGÍA E INNOVACIÓN

C/ ALBACETE, 5, 8ª planta Este
MADRID - 28027
TF: 91 603 71 63
FAX: 91 603 70 05

G. LETTER OF THE ETHICS COMMITTEE OF RESEARCH IN HUMANS OF THE UNIVERSITY OF VALENCIA

VNIVERSITAT DE VALÈNCIA
Vicerectorat d'Investigació i Política Científica

To whom it may concern

I, **Fernando A. Verdú Pascual**, Titular Professor of Legal and Forensic Medicine, and Secretary of the Ethics Committee of Research in Humans of the Ethics Commission in Experimental Research of University of Valencia, hereby certify that the Ethics Committee of Research in Humans, in the session which took place on 15th July 2013, analysed the project entitled "*Success Factors in funding Acquisition for Research Projects through Competitive Calls"*, whose researcher in charge is Alejandro Escribá Esteve, and agreed with this project concerning its ethical aspects, as it respects the fundamental principles established in the Delcaration of Helsinki, in the Agreement of the European Council on Human Rights and complies with the requirements established by Spanish legislation concerning biomedical research, the protection of personal data , and bioethics.

Valencia, 15th Octubre 2013.

FERNANDO ALEJO|VERDU|
PASCUAL
Certifico la precisión e
integridad de este documento
2013.10.15 16:10:42 +02'00'

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VNIVERSITAT DE VALÈNCIA Facultat d'Economia
Departament de Direcció d'Empreses "Juan José Renau Piqueras"

COMPROMISO DE CONFIDENCIALIDAD Y DE ACCESO A RESULTADOS

D. Alejandro Escribá-Esteve, con DNI 20805715F, en calidad de responsable y coordinador del proyecto de investigación "The Spanish 2020 Challenge", avalado por la Secretaría General de Ciencia, Tecnología e Innovación, y realizado por la Universitat de València y FISABIO, se compromete a mantener la más estricta confidencialidad de la información recibida por parte de los centros y personas entrevistadas velar por el cumplimiento del compromiso de confidencialidad por parte de todos los miembros del equipo de investigación.

Cada uno de los participantes en la investigación ha firmado a su vez un compromiso de confidencialidad en los mismos términos.

En nombre del equipo responsable del proyecto declara que:

- Todos los miembros del equipo mantendrán la más absoluta confidencialidad sobre la información recibida por parte de los centros de investigación y personas entrevistadas, bien mediante cuestionarios o mediante visitas y entrevistas personales, con relación a los aspectos relacionados con las solicitudes de proyectos de investigación en programas de financiación competitiva, así como de los resultados de dichas solicitudes.
- Los datos recibidos serán utilizados únicamente con fines de investigación, y para su tratamiento estadístico.
- Ningún dato individual ni personal al que se pueda tener acceso por parte del equipo se hará público por ningún medio ni aparecerá publicado de manera individualizada.
- No se transferirá la información recibida a terceras personas no participantes en el equipo de investigación.
- Las publicaciones que puedan derivarse de este convenio de investigación recojerán únicamente resultados tratados de modo agregado (medias, medidas de dispersión, regresiones, etc.).

Asimismo, el equipo de investigación se compromete a compartir los resultados agregados y los informes que puedan desarrollarse a partir de este proyecto con todos los centros participante.

Alejandro Escribá
Profesor Titular de Universidad
Área de Organización de Empresas
Director del proyecto The Spanish 2020 Challenge

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